

**Main Criteria:** Forward Education  
**Secondary Criteria:** Massachusetts Curriculum Frameworks  
**Subjects:** Mathematics, Science, Technology Education  
**Grades:** 11, 12, Key Stage 4

## Forward Education

### Autonomous Electric Vehicles of the Future

**Massachusetts Curriculum Frameworks**  
**Mathematics**  
Grade 11 - Adopted: 2017

FOCUS / COURSE	MA.MP.	Mathematical Practice
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STRAND	MP.1.	Make sense of problems and persevere in solving them.
STRAND	MP.2.	Reason abstractly and quantitatively.
STRAND	MP.3.	Construct viable arguments and critique the reasoning of others.
STRAND	MP.4.	Model with mathematics.
STRAND	MP.8.	Look for and express regularity in repeated reasoning.

FOCUS / COURSE	MA.CC.	High School Content Standards by Conceptual Categories
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STRAND	A-CED.	Algebra Content Standards - Creating Equations
STANDARD / CONCEPT / SKILL	A-CED.A.	Create equations that describe numbers or relationships.

INDICATOR	A-CED.A.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
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FOCUS / COURSE	MA.CC.	High School Content Standards by Conceptual Categories
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STRAND	A-REI.	Algebra Content Standards - Reasoning with Equations and Inequalities
STANDARD / CONCEPT / SKILL	A-REI.A.	Understand solving equations as a process of reasoning and explain the reasoning.

INDICATOR	A-REI.A.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify or refute a solution method.
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FOCUS / COURSE	MA.CC.	High School Content Standards by Conceptual Categories
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STRAND	F-IF.	Functions Overview - Interpreting Functions
STANDARD / CONCEPT / SKILL	F-IF.C.	Analyze functions using different representations.

INDICATOR	F-IF.C.7.	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
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EXPECTATION	F-IF.C.7.a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.
<b>FOCUS / COURSE</b>	<b>MA.CC.</b>	<b>High School Content Standards by Conceptual Categories</b>
<b>STRAND</b>	<b>F-LE.</b>	<b>Functions Overview - Linear, Quadratic, and Exponential Models</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>F-LE.A.</b>	<b>Construct and compare linear, quadratic, and exponential models and solve problems.</b>
<b>INDICATOR</b>	<b>F-LE.A.1.</b>	<b>Distinguish between situations that can be modeled with linear functions and with exponential functions.</b>

EXPECTATION	F-LE.A.1.a.	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
<b>FOCUS / COURSE</b>	<b>MA.CC.</b>	<b>High School Content Standards by Conceptual Categories</b>
<b>STRAND</b>	<b>G-GPE.</b>	<b>Geometry Content Standards - Expressing Geometric Properties with Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>G-GPE.B.</b>	<b>Use coordinates to prove simple geometric theorems algebraically.</b>

INDICATOR	G-GPE.B.5.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
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<b>FOCUS / COURSE</b>	<b>MA.AI.</b>	<b>Model Algebra I Content Standards [AI]</b>
<b>STRAND</b>	<b>AI.A-CED.</b>	<b>Algebra - Creating Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>AI.A-CED.A.</b>	<b>Create equations that describe numbers or relationships.</b>

INDICATOR	AI.A-CED.A.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
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<b>FOCUS / COURSE</b>	<b>MA.AI.</b>	<b>Model Algebra I Content Standards [AI]</b>
<b>STRAND</b>	<b>AI.A-REI.</b>	<b>Algebra - Reasoning with Equations and Inequalities</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>AI.A-REI.A.</b>	<b>Understand solving equations as a process of reasoning and explain the reasoning.</b>

INDICATOR	AI.A-REI.A.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify or refute a solution method.
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<b>FOCUS / COURSE</b>	<b>MA.AI.</b>	<b>Model Algebra I Content Standards [AI]</b>
<b>STRAND</b>	<b>AI.F-IF.</b>	<b>Functions - Interpreting Functions</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>AI.F-IF.C.</b>	<b>Analyze functions using different representations.</b>

<b>INDICATOR</b>	<b>AI.F-IF.C.7.</b>	<b>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</b>
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EXPECTATION AI.F-IF.C.7.a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

<b>FOCUS / COURSE</b>	<b>MA.AI.</b>	<b>Model Algebra I Content Standards [AI]</b>
<b>STRAND</b>	<b>AI.F-LE.</b>	<b>Linear, Quadratic, and Exponential Models</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>AI.F-LE.A.</b>	<b>Construct and compare linear, quadratic, and exponential models and solve problems.</b>

<b>INDICATOR</b>	<b>AI.F-LE.A.1.</b>	<b>Distinguish between situations that can be modeled with linear functions and with exponential functions.</b>
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EXPECTATION AI.F-LE.A.1.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

<b>FOCUS / COURSE</b>	<b>MA.GEO.</b>	<b>Model Geometry Content Standards [GEO]</b>
<b>STRAND</b>	<b>GEO.G-GPE.</b>	<b>Expressing Geometric Properties with Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>GEO.G-GPE.B.</b>	<b>Use coordinates to prove simple geometric theorems algebraically.</b>

INDICATOR GEO.G-GPE.B.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

<b>FOCUS / COURSE</b>	<b>MA.AII.</b>	<b>Model Algebra II Content Standards [AII]</b>
<b>STRAND</b>	<b>AII.A-CED.</b>	<b>Creating Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>AII.A-CED.A.</b>	<b>Create equations that describe numbers or relationships.</b>

INDICATOR AII.A-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
<b>STRAND</b>	<b>MI.A-CED.</b>	<b>Creating Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.A-CED.A.</b>	<b>Create equations that describe numbers or relationships.</b>

INDICATOR MI.A-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
<b>STRAND</b>	<b>MI.A-REI.</b>	<b>Reasoning with Equations and Inequalities</b>

<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.A-REI.A.</b>	<b>Understand solving equations as a process of reasoning and explain the reasoning.</b>
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INDICATOR MI.A-REI.A.1 Explain each step in solving a simple linear equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify or refute a solution method.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
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<b>STRAND</b>	<b>MI.F-IF.</b>	<b>Functions - Interpreting Functions</b>
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<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.F-IF.C.</b>	<b>Analyze functions using different representations.</b>
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<b>INDICATOR</b>	<b>MI.F-IF.C.7.</b>	<b>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</b>
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EXPECTATION MI.F-IF.C.7.a. Graph linear functions and show intercepts.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
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<b>STRAND</b>	<b>MI.F-LE.</b>	<b>Linear, Quadratic, and Exponential Models</b>
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<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.F-LE.A.</b>	<b>Construct and compare linear and exponential models and solve problems.</b>
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<b>INDICATOR</b>	<b>MI.F-LE.A.1.</b>	<b>Distinguish between situations that can be modeled with linear functions and with exponential functions.</b>
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EXPECTATION MI.F-LE.A.1.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
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<b>STRAND</b>	<b>MI.G-GPE.</b>	<b>Expressing Geometric Properties with Equations</b>
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<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.G-GPE.B.</b>	<b>Use coordinates to prove simple geometric theorems algebraically.</b>
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INDICATOR MI.G-GPE.B.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

<b>FOCUS / COURSE</b>	<b>MA.MII.</b>	<b>Model Mathematics II Content Standards [MII]</b>
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<b>STRAND</b>	<b>MII.A-CED.</b>	<b>Creating Equations</b>
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<b>STANDARD / CONCEPT / SKILL</b>	<b>MII.A-CED.A.</b>	<b>Create equations that describe numbers or relationships.</b>
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INDICATOR MII.A-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

<b>FOCUS / COURSE</b>	<b>MA.MII.</b>	<b>Model Mathematics II Content Standards [MII]</b>
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<b>STRAND</b>	<b>MII.F-IF.</b>	<b>Functions - Interpreting Functions</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MII.F-IF.C.</b>	Analyze functions using different representations.
<b>INDICATOR</b>	<b>MII.F-IF.C.7.</b>	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

EXPECTATION    MII.F-IF.C.7.a.    Graph quadratic functions and show intercepts, maxima, and minima.

<b>FOCUS / COURSE</b>	<b>MA.MIII.</b>	<b>Model Mathematics III Content Standards [MIII]</b>
<b>STRAND</b>	<b>MIII.A-CED.</b>	<b>Creating Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MIII.A-CED.A.</b>	Create equations that describe numbers or relationships.

INDICATOR    MIII.A-CED.A.2.    Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

**Massachusetts Curriculum Frameworks**  
**Mathematics**  
Grade 12 - Adopted: 2017

<b>FOCUS / COURSE</b>	<b>MA.MP.</b>	<b>Mathematical Practice</b>
STRAND	MP.1.	Make sense of problems and persevere in solving them.
STRAND	MP.2.	Reason abstractly and quantitatively.
STRAND	MP.3.	Construct viable arguments and critique the reasoning of others.
STRAND	MP.4.	Model with mathematics.
STRAND	MP.8.	Look for and express regularity in repeated reasoning.

<b>FOCUS / COURSE</b>	<b>MA.CC.</b>	<b>High School Content Standards by Conceptual Categories</b>
<b>STRAND</b>	<b>A-CED.</b>	<b>Algebra Content Standards - Creating Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>A-CED.A.</b>	Create equations that describe numbers or relationships.

INDICATOR    A-CED.A.2.    Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

<b>FOCUS / COURSE</b>	<b>MA.CC.</b>	<b>High School Content Standards by Conceptual Categories</b>
<b>STRAND</b>	<b>A-REI.</b>	<b>Algebra Content Standards - Reasoning with Equations and Inequalities</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>A-REI.A.</b>	Understand solving equations as a process of reasoning and explain the reasoning.

INDICATOR	A-REI.A.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify or refute a solution method.
<b>FOCUS / COURSE</b>	<b>MA.CC.</b>	<b>High School Content Standards by Conceptual Categories</b>
<b>STRAND</b>	<b>F-IF.</b>	<b>Functions Overview - Interpreting Functions</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>F-IF.C.</b>	<b>Analyze functions using different representations.</b>
INDICATOR	F-IF.C.7.	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

EXPECTATION F-IF.C.7.a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

<b>FOCUS / COURSE</b>	<b>MA.CC.</b>	<b>High School Content Standards by Conceptual Categories</b>
<b>STRAND</b>	<b>F-LE.</b>	<b>Functions Overview - Linear, Quadratic, and Exponential Models</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>F-LE.A.</b>	<b>Construct and compare linear, quadratic, and exponential models and solve problems.</b>
INDICATOR	F-LE.A.1.	Distinguish between situations that can be modeled with linear functions and with exponential functions.

EXPECTATION F-LE.A.1.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

<b>FOCUS / COURSE</b>	<b>MA.CC.</b>	<b>High School Content Standards by Conceptual Categories</b>
<b>STRAND</b>	<b>G-GPE.</b>	<b>Geometry Content Standards - Expressing Geometric Properties with Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>G-GPE.B.</b>	<b>Use coordinates to prove simple geometric theorems algebraically.</b>

INDICATOR G-GPE.B.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

<b>FOCUS / COURSE</b>	<b>MA.AI.</b>	<b>Model Algebra I Content Standards [AI]</b>
<b>STRAND</b>	<b>AI.A-CED.</b>	<b>Algebra - Creating Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>AI.A-CED.A.</b>	<b>Create equations that describe numbers or relationships.</b>

INDICATOR AI.A-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

<b>FOCUS / COURSE</b>	<b>MA.AI.</b>	<b>Model Algebra I Content Standards [AI]</b>
<b>STRAND</b>	<b>AI.A-REI.</b>	<b>Algebra - Reasoning with Equations and Inequalities</b>

<b>STANDARD / CONCEPT / SKILL</b>	<b>AI.A-REI.A.</b>	<b>Understand solving equations as a process of reasoning and explain the reasoning.</b>
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INDICATOR AI.A-REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify or refute a solution method.

<b>FOCUS / COURSE</b>	<b>MA.AI.</b>	<b>Model Algebra I Content Standards [AI]</b>
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<b>STRAND</b>	<b>AI.F-IF.</b>	<b>Functions - Interpreting Functions</b>
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<b>STANDARD / CONCEPT / SKILL</b>	<b>AI.F-IF.C.</b>	<b>Analyze functions using different representations.</b>
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<b>INDICATOR</b>	<b>AI.F-IF.C.7.</b>	<b>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</b>
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EXPECTATION AI.F-IF.C.7.a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

<b>FOCUS / COURSE</b>	<b>MA.AI.</b>	<b>Model Algebra I Content Standards [AI]</b>
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<b>STRAND</b>	<b>AI.F-LE.</b>	<b>Linear, Quadratic, and Exponential Models</b>
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<b>STANDARD / CONCEPT / SKILL</b>	<b>AI.F-LE.A.</b>	<b>Construct and compare linear, quadratic, and exponential models and solve problems.</b>
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<b>INDICATOR</b>	<b>AI.F-LE.A.1.</b>	<b>Distinguish between situations that can be modeled with linear functions and with exponential functions.</b>
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EXPECTATION AI.F-LE.A.1.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

<b>FOCUS / COURSE</b>	<b>MA.GEO.</b>	<b>Model Geometry Content Standards [GEO]</b>
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<b>STRAND</b>	<b>GEO.G-GPE.</b>	<b>Expressing Geometric Properties with Equations</b>
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<b>STANDARD / CONCEPT / SKILL</b>	<b>GEO.G-GPE.B.</b>	<b>Use coordinates to prove simple geometric theorems algebraically.</b>
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INDICATOR GEO.G-GPE.B.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

<b>FOCUS / COURSE</b>	<b>MA.AII.</b>	<b>Model Algebra II Content Standards [AII]</b>
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<b>STRAND</b>	<b>AII.A-CED.</b>	<b>Creating Equations</b>
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<b>STANDARD / CONCEPT / SKILL</b>	<b>AII.A-CED.A.</b>	<b>Create equations that describe numbers or relationships.</b>
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INDICATOR AII.A-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
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<b>STRAND</b>	<b>MI.A-CED.</b>	<b>Creating Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.A-CED.A.</b>	<b>Create equations that describe numbers or relationships.</b>

INDICATOR MI.A-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
<b>STRAND</b>	<b>MI.A-REI.</b>	<b>Reasoning with Equations and Inequalities</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.A-REI.A.</b>	<b>Understand solving equations as a process of reasoning and explain the reasoning.</b>

INDICATOR MI.A-REI.A.1. Explain each step in solving a simple linear equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify or refute a solution method.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
<b>STRAND</b>	<b>MI.F-IF.</b>	<b>Functions - Interpreting Functions</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.F-IF.C.</b>	<b>Analyze functions using different representations.</b>
<b>INDICATOR</b>	<b>MI.F-IF.C.7.</b>	<b>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</b>

EXPECTATION MI.F-IF.C.7.a. Graph linear functions and show intercepts.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
<b>STRAND</b>	<b>MI.F-LE.</b>	<b>Linear, Quadratic, and Exponential Models</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.F-LE.A.</b>	<b>Construct and compare linear and exponential models and solve problems.</b>
<b>INDICATOR</b>	<b>MI.F-LE.A.1.</b>	<b>Distinguish between situations that can be modeled with linear functions and with exponential functions.</b>

EXPECTATION MI.F-LE.A.1.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

<b>FOCUS / COURSE</b>	<b>MA.MI.</b>	<b>Model Mathematics I Content Standards [MI]</b>
<b>STRAND</b>	<b>MI.G-GPE.</b>	<b>Expressing Geometric Properties with Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MI.G-GPE.B.</b>	<b>Use coordinates to prove simple geometric theorems algebraically.</b>

INDICATOR MI.G-GPE.B.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).



<b>FOCUS / COURSE</b>	<b>MA.MII.</b>	<b>Model Mathematics II Content Standards [MII]</b>
<b>STRAND</b>	<b>MII.A-CED.</b>	<b>Creating Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MII.A-CED.A.</b>	<b>Create equations that describe numbers or relationships.</b>

INDICATOR      MII.A-CED.A.2.      Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

<b>FOCUS / COURSE</b>	<b>MA.MII.</b>	<b>Model Mathematics II Content Standards [MII]</b>
<b>STRAND</b>	<b>MII.F-IF.</b>	<b>Functions - Interpreting Functions</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MII.F-IF.C.</b>	<b>Analyze functions using different representations.</b>

INDICATOR      MII.F-IF.C.7.      Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

EXPECTATION      MII.F-IF.C.7.a.      Graph quadratic functions and show intercepts, maxima, and minima.

<b>FOCUS / COURSE</b>	<b>MA.MIII.</b>	<b>Model Mathematics III Content Standards [MIII]</b>
<b>STRAND</b>	<b>MIII.A-CED.</b>	<b>Creating Equations</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>MIII.A-CED.A.</b>	<b>Create equations that describe numbers or relationships.</b>

INDICATOR      MIII.A-CED.A.2.      Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

**Massachusetts Curriculum Frameworks  
Science**

Grade 11 - Adopted: 2016

<b>FOCUS / COURSE</b>	<b>MA.HS-ESS.</b>	<b>High School Earth and Space Science</b>
<b>STRAND</b>	<b>ESS2.</b>	<b>Earth's Systems</b>

STANDARD / CONCEPT / SKILL      HS-ESS2-4.      Use a model to describe how variations in the flow of energy into and out of Earth's systems over different time scales result in changes in climate. Analyze and interpret data to explain that long-term changes in Earth's tilt and orbit result in cycles of climate change such as Ice Ages.

STANDARD / CONCEPT / SKILL      HS-ESS2-6.      Use a model to describe cycling of carbon through the ocean, atmosphere, soil, and biosphere and how increases in carbon dioxide concentrations due to human activity have resulted in atmospheric and climate changes.

<b>FOCUS / COURSE</b>	<b>MA.HS-ESS.</b>	<b>High School Earth and Space Science</b>
<b>STRAND</b>	<b>ESS3.</b>	<b>Earth and Human Activity</b>

STANDARD / CONCEPT / SKILL	HS- ESS3-1.	Construct an explanation based on evidence for how the availability of key natural resources and changes due to variations in climate have influenced human activity.
STANDARD / CONCEPT / SKILL	HS- ESS3-3.	Illustrate relationships among management of natural resources, the sustainability of human populations, and biodiversity.
<b>FOCUS / COURSE</b>	<b>MA.HS- LS.</b>	<b>High School Biology</b>
<b>STRAND</b>	<b>LS2.</b>	<b>Ecosystems: Interactions, Energy, and Dynamics</b>
STANDARD / CONCEPT / SKILL	HS-LS2- 7.	Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health.
<b>FOCUS / COURSE</b>	<b>MA.HS- PS.</b>	<b>High School Chemistry</b>
<b>STRAND</b>	<b>PS1.</b>	<b>Matter and Its Interactions</b>
STANDARD / CONCEPT / SKILL	HS-PS1- 4.	Develop a model to illustrate the energy transferred during an exothermic or endothermic chemical reaction based on the bond energy difference between bonds broken (absorption of energy) and bonds formed (release of energy).
<b>FOCUS / COURSE</b>	<b>MA.HS- PS.</b>	<b>High School Introductory Physics</b>
<b>STRAND</b>	<b>PS3.</b>	<b>Energy</b>
STANDARD / CONCEPT / SKILL	HS-PS3- 3.	Design and evaluate a device that works within given constraints to convert one form of energy into another form of energy.
<b>FOCUS / COURSE</b>	<b>MA.HS- ETS.</b>	<b>High School Technology/Engineering</b>
<b>STRAND</b>	<b>ETS1.</b>	<b>Engineering Design</b>
STANDARD / CONCEPT / SKILL	HS- ETS1-1.	Analyze a major global challenge to specify a design problem that can be improved. Determine necessary qualitative and quantitative criteria and constraints for solutions, including any requirements set by society.
STANDARD / CONCEPT / SKILL	HS- ETS1-2.	Break a complex real-world problem into smaller, more manageable problems that each can be solved using scientific and engineering principles.
STANDARD / CONCEPT / SKILL	HS- ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, aesthetics, and maintenance, as well as social, cultural, and environmental impacts.
STANDARD / CONCEPT / SKILL	HS- ETS1- 6(MA).	Document and present solutions that include specifications, performance results, successes and remaining issues, and limitations.

<b>FOCUS / COURSE</b>	<b>MA.RST.11-12.</b>	<b>Reading Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Key Ideas and Details</b>

STANDARD / CONCEPT / SKILL      RST.11-12.2.      Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

STANDARD / CONCEPT / SKILL      RST.11-12.3.      Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

<b>FOCUS / COURSE</b>	<b>MA.RST.11-12.</b>	<b>Reading Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Craft and Structure</b>

STANDARD / CONCEPT / SKILL      RST.11-12.4.      Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

STANDARD / CONCEPT / SKILL      RST.11-12.5.      Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

<b>FOCUS / COURSE</b>	<b>MA.RST.11-12.</b>	<b>Reading Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Integration of Knowledge and Ideas</b>

STANDARD / CONCEPT / SKILL      RST.11-12.9.      Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

<b>FOCUS / COURSE</b>	<b>MA.RST.11-12.</b>	<b>Reading Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Range of Reading and Level of Text Complexity</b>

STANDARD / CONCEPT / SKILL      RST.11-12.10.      By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

<b>FOCUS / COURSE</b>	<b>MA.WHST.11-12.</b>	<b>Writing Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Text Types and Purposes</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>WHST.11-12.2.</b>	<b>Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</b>

INDICATOR      WHST.11-12.2(d)      Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

<b>FOCUS / COURSE</b>	<b>MA.WHST.11-12.</b>	<b>Writing Standards for Literacy in Science and Technical Subjects</b>
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<b>Production and Distribution of Writing</b>		
STANDARD / CONCEPT / SKILL	WHST.11 -12.4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
STANDARD / CONCEPT / SKILL	WHST.11 -12.6.	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

**Massachusetts Curriculum Frameworks**  
**Science**  
Grade 12 - Adopted: 2016

FOCUS / COURSE	MA.HS- ESS.	High School Earth and Space Science
STANDARD	ESS2.	<b>Earth's Systems</b>
STANDARD / CONCEPT / SKILL	HS- ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems over different time scales result in changes in climate. Analyze and interpret data to explain that long-term changes in Earth's tilt and orbit result in cycles of climate change such as Ice Ages.
STANDARD / CONCEPT / SKILL	HS- ESS2-6.	Use a model to describe cycling of carbon through the ocean, atmosphere, soil, and biosphere and how increases in carbon dioxide concentrations due to human activity have resulted in atmospheric and climate changes.

FOCUS / COURSE	MA.HS- ESS.	High School Earth and Space Science
STANDARD	ESS3.	<b>Earth and Human Activity</b>
STANDARD / CONCEPT / SKILL	HS- ESS3-1.	Construct an explanation based on evidence for how the availability of key natural resources and changes due to variations in climate have influenced human activity.
STANDARD / CONCEPT / SKILL	HS- ESS3-3.	Illustrate relationships among management of natural resources, the sustainability of human populations, and biodiversity.

FOCUS / COURSE	MA.HS- LS.	High School Biology
STANDARD	LS2.	<b>Ecosystems: Interactions, Energy, and Dynamics</b>
STANDARD / CONCEPT / SKILL	HS-LS2- 7.	Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health.

FOCUS / COURSE	MA.HS- PS.	High School Chemistry
STANDARD	PS1.	<b>Matter and Its Interactions</b>
STANDARD / CONCEPT / SKILL	HS-PS1- 4.	Develop a model to illustrate the energy transferred during an exothermic or endothermic chemical reaction based on the bond energy difference between bonds broken (absorption of energy) and bonds formed (release of energy).

<b>FOCUS / COURSE</b>	<b>MA.HS-PS.</b>	<b>High School Introductory Physics</b>
<b>STRAND</b>	<b>PS3.</b>	<b>Energy</b>

STANDARD / CONCEPT / SKILL      HS-PS3-3.      Design and evaluate a device that works within given constraints to convert one form of energy into another form of energy.

<b>FOCUS / COURSE</b>	<b>MA.HS-ETS.</b>	<b>High School Technology/Engineering</b>
<b>STRAND</b>	<b>ETS1.</b>	<b>Engineering Design</b>

STANDARD / CONCEPT / SKILL      HS-ETS1-1.      Analyze a major global challenge to specify a design problem that can be improved. Determine necessary qualitative and quantitative criteria and constraints for solutions, including any requirements set by society.

STANDARD / CONCEPT / SKILL      HS-ETS1-2.      Break a complex real-world problem into smaller, more manageable problems that each can be solved using scientific and engineering principles.

STANDARD / CONCEPT / SKILL      HS-ETS1-3.      Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, aesthetics, and maintenance, as well as social, cultural, and environmental impacts.

STANDARD / CONCEPT / SKILL      HS-ETS1-6(MA).      Document and present solutions that include specifications, performance results, successes and remaining issues, and limitations.

Grade 12 - Adopted: 2010

<b>FOCUS / COURSE</b>	<b>MA.RST.11-12.</b>	<b>Reading Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Key Ideas and Details</b>

STANDARD / CONCEPT / SKILL      RST.11-12.2.      Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

STANDARD / CONCEPT / SKILL      RST.11-12.3.      Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

<b>FOCUS / COURSE</b>	<b>MA.RST.11-12.</b>	<b>Reading Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Craft and Structure</b>

STANDARD / CONCEPT / SKILL      RST.11-12.4.      Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

STANDARD / CONCEPT / SKILL      RST.11-12.5.      Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

<b>FOCUS / COURSE</b>	<b>MA.RST.11-12.</b>	<b>Reading Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Integration of Knowledge and Ideas</b>

STANDARD / CONCEPT / SKILL      RST.11-12.9.      Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

<b>FOCUS / COURSE</b>	<b>MA.RST.11-12.</b>	<b>Reading Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Range of Reading and Level of Text Complexity</b>

STANDARD / CONCEPT / SKILL      RST.11-12.10.      By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

<b>FOCUS / COURSE</b>	<b>MA.WHST.11-12.</b>	<b>Writing Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Text Types and Purposes</b>
<b>STANDARD / CONCEPT / SKILL</b>	<b>WHST.11-12.2.</b>	<b>Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</b>

INDICATOR      WHST.11-12.2(d)      Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

<b>FOCUS / COURSE</b>	<b>MA.WHST.11-12.</b>	<b>Writing Standards for Literacy in Science and Technical Subjects</b>
<b>STRAND</b>		<b>Production and Distribution of Writing</b>

STANDARD / CONCEPT / SKILL      WHST.11-12.4.      Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

STANDARD / CONCEPT / SKILL      WHST.11-12.6.      Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

**Massachusetts Curriculum Frameworks**  
**Technology Education**  
Grade 11 - Adopted: 2016

<b>FOCUS / COURSE</b>	<b>MA.9-12.CT.</b>	<b>Grades 9 – 12: Computational Thinking (CT)</b>
<b>STRAND</b>	<b>9-12.CT.b.</b>	<b>Algorithms</b>

STANDARD / CONCEPT / SKILL      9-12.CT.b.1.      Recognize that the design of an algorithm is distinct from its expression in a programming language.

STANDARD / CONCEPT / SKILL      9-12.CT.b.5.      Explain that there are some problems which cannot be computationally solved.

Massachusetts Curriculum Frameworks  
**Technology Education**  
 Grade 12 - Adopted: 2016

<b>FOCUS / COURSE</b>	MA.9-12.CT.	Grades 9 – 12: Computational Thinking (CT)
<b>STRAND</b>	9-12.CT.b.	<b>Algorithms</b>

STANDARD / CONCEPT / SKILL	9-12.CT.b.1.	Recognize that the design of an algorithm is distinct from its expression in a programming language.
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STANDARD / CONCEPT / SKILL	9-12.CT.b.5.	Explain that there are some problems which cannot be computationally solved.
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