House Bill 5 Section 28.014 College Preparatory Course

El Paso Community College

Mathematics

The richest man in the world needs to figure out what the last digit (the digit in the “ones”place) of the number 4^{200} is. He is willing to give the first person who can tell him this number 10,000 dollars. What is the last digit of the number?

Student's should be able to:

- draw on one's entire mathematical experience to figure out an appropriate next step in a problem.

- have multiple perspective on mathematical concepts.

Examples:

Function: familiar with different aspects of the idea of a function – as an equation, as a rule, as a graph, as a table, as an input-output machine – and be able to move back and forth easily among these representations.

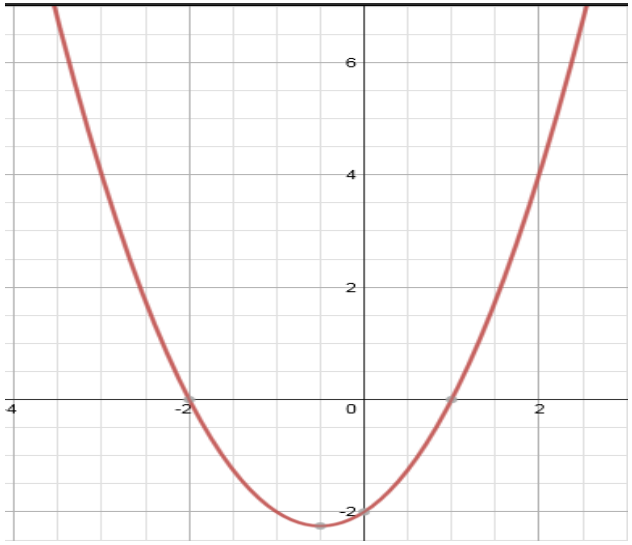
Quadratic Functions: Understanding what needs to be done to graph a quadratic function. Should also be familiar with all the names that identify solutions for quadratic functions.

Given $f(x) = x^2 + x - 2$ determine if the graph crosses the x-axis. If the graph crosses the x-axis identify where the graph crosses the x-axis.

Solve $x^2 + x - 2 = 0$.

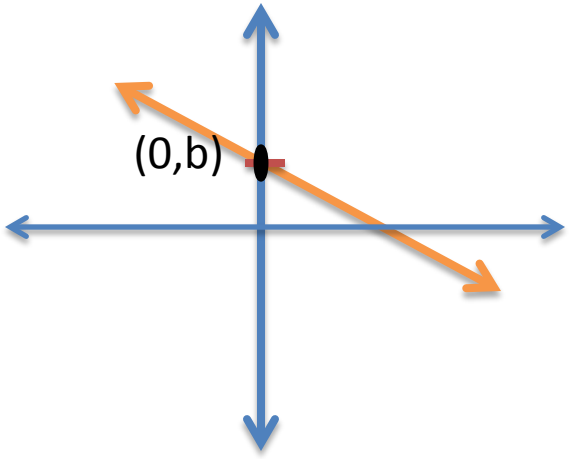
Find all the zeros of $f(x) = x^2 + x - 2$.

The graph of a quadratic function is given. Write the function's equation.



Linear Equations:

Write the equation of a line for the graph below.



$$y - y_1 = m(x - x_1)$$ Point-Slope Form

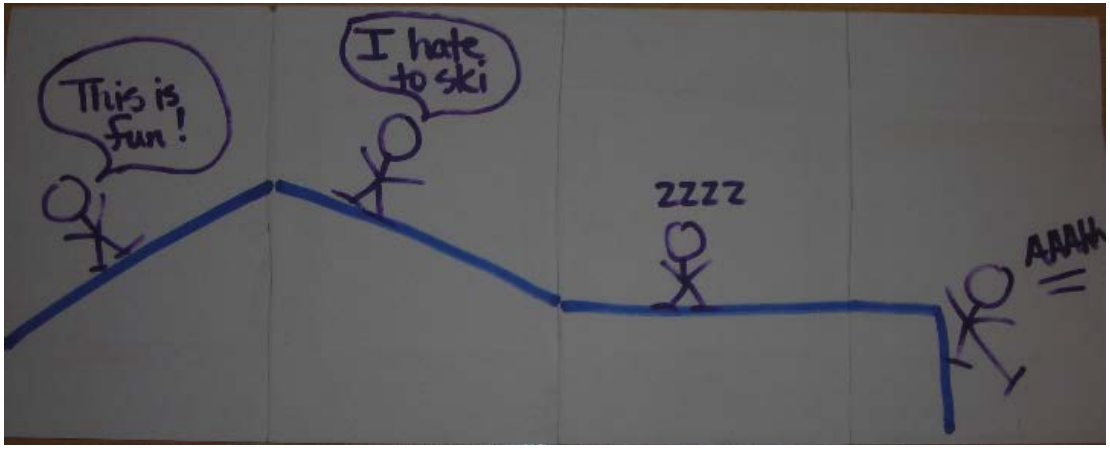
$$y - b = m(x - 0)$$

$$y - b = m(x)$$

$$y = mx + b$$ Slope-Intercept Form

Hands-On Activities

1. Equations of Attack Activity Sheet
2. Linear Equations-Cut & Paste
3. Order of Operations-Bingo
4. Slope



Unit I: Factoring

1. Factoring trinomials of the form $ax^2 + bx + c$.
2. Factor the difference of two squares, perfect-square trinomials, sum and difference of two cubes and trinomials that are quadratic in form.
3. Solve equations by factoring.
4. Solve applications involving above objectives.

Factoring Example #1

Find all zeros of the following functions and give the multiplicity of each zero. State whether the graph crosses the x – axis or touches the x – axis and turns around at each zero.

$$f(x) = x^3 + 4x^2 - 3x - 12$$

Factoring Example #1 Solution

$$f(x) = x^3 + 3x^2 - 4x - 12$$

$$0 = (x^3 + 3x^2) + (-4x - 12)$$

$$0 = x^2(x + 3) - 4(x + 3)$$

$$0 = (x + 3)(x^2 - 4)$$

$$0 = (x + 3)(x - 2)(x + 2)$$

$x + 3 = 0$	$x - 2 = 0$	$x + 2 = 0$
$x = -3$	$x = 2$	$x = -2$
Multiplicity of 1 Crosses the x-axis at $x = -3$	Multiplicity of 1 Crosses the x-axis at $x = 2$	Multiplicity of 1 Crosses the x-axis at $x = -2$

Factoring Example #2

Find all zeros of the following functions and give the multiplicity of each zero. State whether the graph crosses the x – axis or touches the x – axis and turns around at each zero.

$$f(x) = x^4 - 9x^2$$

Factoring Example #2 Solution

$$f(x) = x^4 - 9x^2$$

$$0 = x^4 - 9x^2$$

$$0 = x^2(x^2 - 9)$$

$$0 = x^2(x - 3)(x + 3)$$

$x = 0$

Multiplicity of 2
Touches the x-axis and turns around at $x = 0$

$x - 3 = 0$

$x = 3$

Multiplicity of 1
Crosses the x-axis at $x = 3$

$x + 3 = 0$

$x = -3$

Multiplicity of 1
Crosses the x-axis at $x = -3$

Unit IV: Quadratic Equations and Functions, non-linear inequalities

1. Understand and use the root square property, completing the square, and quadratic formula to solve quadratic equations.
2. Solve equations that are quadratic in form.
3. Solve nonlinear inequalities.
4. Graph quadratic functions using points, x-intercepts, and the vertex.
5. Solve applications using above objectives.

Quadratic Example #1

Find all the zeros of the function.

$$f(x) = x^3 + 2x^2 - 19x - 20$$

Quadratic Example #1 Solution

$$f(x) = x^3 + 2x^2 - 19x - 20$$
$$0 = x^3 + 2x^2 - 19x - 20$$

Possible Rational Zeros $= \pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20$

$$\begin{array}{c|cccc} 4 & 1 & 2 & -19 & -20 \\ & & 4 & 24 & 20 \\ \hline & 1 & 6 & 5 & 0 \end{array}$$

zero

$$x^2 + 6x + 5 = 0$$
$$(x+5)(x+1) = 0$$
$$x + 5 = 0 \qquad x + 1 = 0$$
$$x = -5 \qquad x = -1$$

zero zero

Solution set = $\{-5,\ -1,\ 4\}$

Quadratic Example #2

Find all the zeros of the function.

$$f(x) = x^3 + 3x^2 - 24x - 26$$

Quadratic Example #2 Solution

$$f(x) = x^3 + 3x^2 - 24x - 26$$
$$0 = x^3 + 3x^2 - 24x - 26$$

Possible Rational Zeros $= \pm 1, \pm 2, \pm 13, \pm 26$

$$\begin{array}{r|cccc} -1 & 1 & 3 & -24 & -26 \\ & & -1 & -2 & 26 \\ \hline & 1 & 2 & -26 & 0 \end{array}$$

zero

$$x^2 + 2x - 26 = 0$$

$$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(1)(-26)}}{2(1)} = \frac{-2 \pm \sqrt{4 + 104}}{2}$$

$$= \frac{-2 \pm \sqrt{108}}{2} = \frac{-2 \pm 6\sqrt{3}}{2}$$

Solution set =

$$\{-1,\ -1 + 3\sqrt{3},\ -1 - 3\sqrt{3}\}$$

$$x = \frac{-2+6\sqrt{3}}{2} \qquad x = \frac{-2-6\sqrt{3}}{2}$$

$$x = -1 + 3\sqrt{3} \qquad x = -1 - 3\sqrt{3}$$

zero zero

Quadratic Example #3

Find all the zeros of the function.

$$f(x) = x^4 - 6x^3 - 3x^2 + 24x - 4$$

Quadratic Example #3 Solution

$$f(x) = x^4 - 6x^3 - 3x^2 + 24x - 4$$
$$0 = x^4 - 6x^3 - 3x^2 + 24x - 4$$

Possible Rational Zeros $= \pm 1, \pm 2, \pm 4$

2 ↑ zero	1	−6	−3	24	−4
		2	−8	−22	4
−2 ↑ zero	1	−4	−11	2	0
		−2	12	−2	
	1	−6	1	0	

$$x^2 - 6x + 1 = 0$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(1)}}{2(1)} = \frac{6 \pm \sqrt{36 - 4}}{2}$$

$$= \frac{6 \pm \sqrt{32}}{2} = \frac{6 \pm 4\sqrt{2}}{2}$$

$x = \frac{6+4\sqrt{2}}{2}$ $\quad$ $x = \frac{6-4\sqrt{2}}{2}$

$x = 3 + 2\sqrt{2}$ $\quad$ $x = 3 - 2\sqrt{2}$

↑ zero $\quad$ ↑ zero

Solution set =

$$\{2, -2, 3 + 2\sqrt{2}, 3 - 2\sqrt{2}\}$$

Domain

3 Questions:

1. Are there fractions?
2. Are there square roots?
3. Are there logarithms?

No to all the above → Domain is all real numbers

Domain Example

Find the domain of the functions.

a. $f(x) = x + 3$

b. $f(x) = \sqrt{4x - 1}$

c. $f(x) = \dfrac{5}{x + 2}$

d. $f(x) = \log_5(3x + 45)$

Domain Example Solutions

a. $f(x) = x + 3$

Function has no fraction.

Function has no square root.

Function has no logarithm.

Domain: $(-\infty, \infty)$

Domain Example Solutions

b. $f(x) = \sqrt{4x - 1}$

Function has no fraction.

Function has no logarithm.

Function has a square root.

$$4x - 1 \geq 0$$

$$x \geq \frac{1}{4}$$

Domain: $\left[\frac{1}{4}, \infty\right)$

Domain Example Solutions

c. $f(x) = \frac{5}{x+2}$

Function has no square root.

Function has no logarithm.

Function has a fraction.

$$x + 2 = 0$$

$$x \neq -2$$

Domain: $(-\infty, -2) \cup (-2, \infty)$

Domain Example Solutions

d. $f(x) = \log_5(3x + 45)$

Function has no fraction.

Function has no square root.

Function has a logarithm.

$$3x + 45 > 0$$
$$x > -15$$

Domain: $(-15, \infty)$

College Preparatory Integrated Mathematics Course I
Learning Objective 1.1

Learning Objective 1.1: Add, subtract, multiply and divide, using order of operations, real numbers and manipulate certain expressions including exponential operations.

Read Section 1.4 on page 25 in the textbook an answer the questions below.

Definitions

1. In the expression 5^2, the 5 is called the _____ and the 2 is called the _____.
2. The symbols ( ), [ ], and { } are examples of _____ symbols.
3. _____notation may be used to write $2 \cdot 2 \cdot 2$ as 2^3.
4. **Order of Operations**: Simplify expressions using the order below.
   1. If grouping symbols such as _____ are present, simplify expressions within those first, starting with the innermost set.
   2. Evaluate _____expressions.
   3. Perform _____or _____in order from left to right.
   4. Perform_____or_____in order from left to right.

Example 1: Simplify each expression.

a) $6 + 3 \cdot 9$

b) $4^3 \div 8 + 3$

Example 2: Simplify each expression.

a) $\left(\frac{2}{3}\right)^2 \cdot |-8|$

b) $\frac{9(14-6)}{|-2|}$

Questions?