

Desmos Graphing Activity #1 of 8

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#1 What happens when I add one to the function?

1 $f(x) = (x+2)(x-4) = 0$

2 $(x+2)(x-4) + 1$

3 Add one to the function. Write it in row 3. You can simply write " $f(x)+1$ " if you wish.

4 $f(x)(x+2)(x-4) + 1$

5 $x+2=0 \rightarrow x=-2$ $x-4=0 \rightarrow x=4$

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#2 What happens when I multiply the function by a negative number?

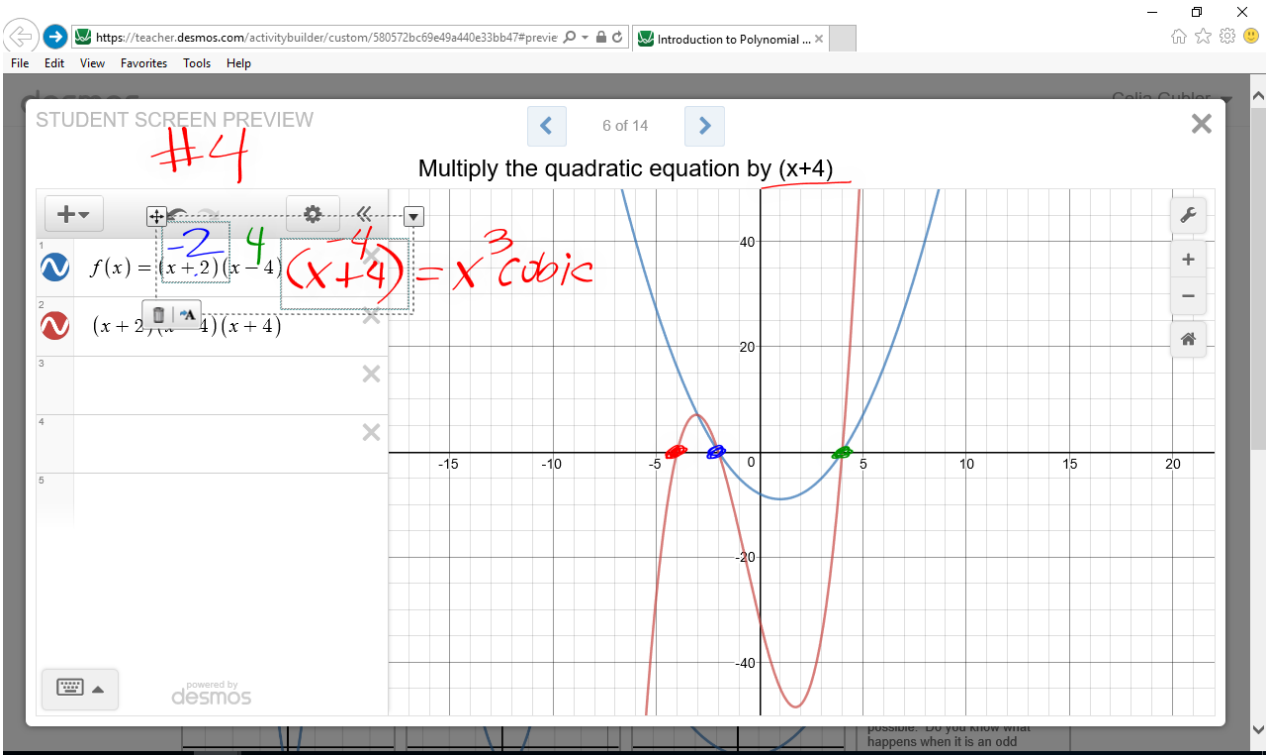
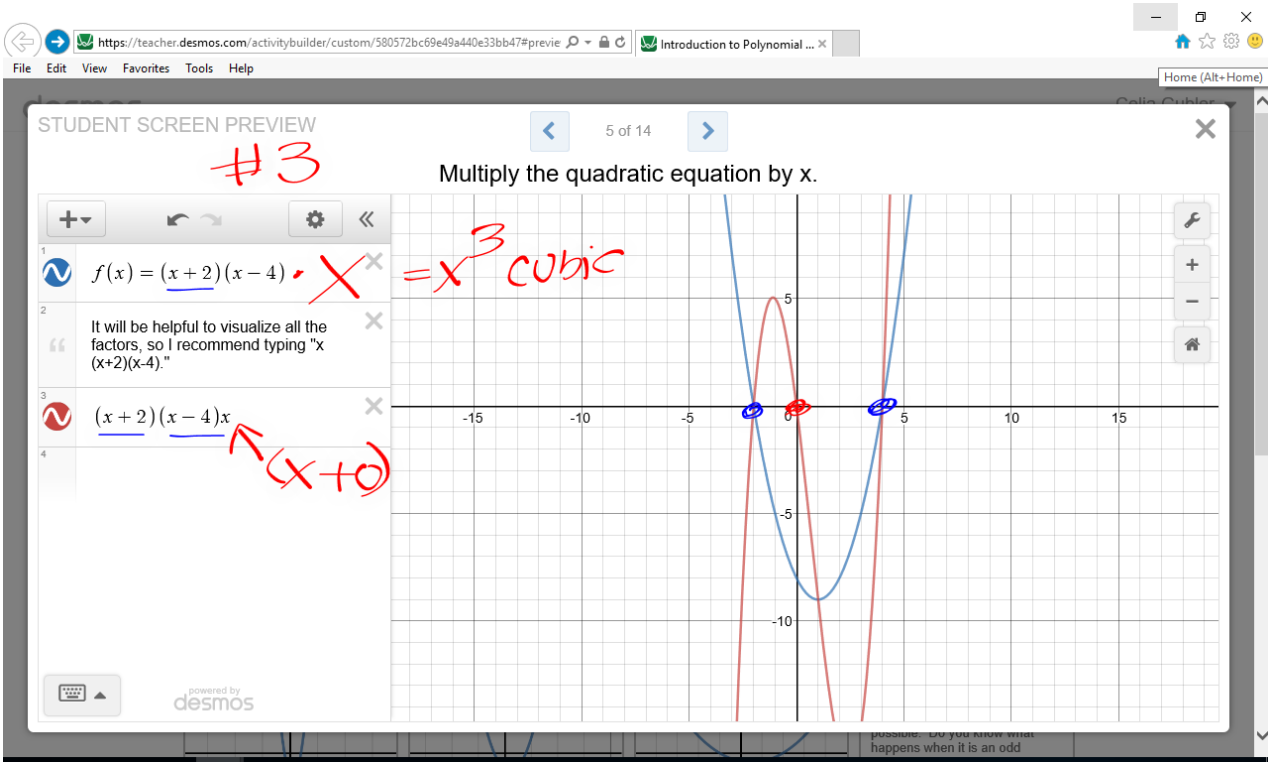
1 $f(x) = (x+2)(x-4)$

2 Multiply $f(x)$ by a negative number. Write your answer in row 3. Again, you can simply write " $-f(x)$ "

3 $-(x+2)(x-4)$

4 *flips, crosses at the points, y intercept is flipped.*

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#5 Multiply the quadratic equation by $(x-4)$

1 $f(x) = (x+2)(x-4)$

2 $(x-4)(x+2)(x-4)$

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

4

5

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#6 Update $f(x)$ so the graph goes through the green points.

1 $f(x) = (x)(x)(x) x^3$

2 $(1,0) \rightarrow (x-1)$

3 $(3,0) \rightarrow (x-3)$

4 $(-1,0) \rightarrow (x+1)$

5 $(x-1)(x-3)(x+1)$

6 $y_2 = (x-1)(x-3)(x+1)$

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#7 Update $f(x)$ so that the graph goes through the green points

$f(x) = (x)(x)(x)$
 $(2,0)$ $(x-2)$
 $(-2,0)$ $(x+2)$
 $(x+2)^2(x-2)$ bounce, pass
 $(x+2)(x-2)^2$ pass, bounce

which one stayed?
 $(x+2)(x-2)$
 Either.

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#8 Write an equation that goes to match the graph.

$-(x+3)^2x$
 $y = (x+3)^2x$
 ↑ negative comes down decreasing.

$(x+3)^2$ bounce
 $(x+0)x$

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How did the graphs in the previous slides change? What happens when you multiply by a factor of x?

Please be as specific as possible. Do you know what happens when it is an odd degree (x^3, x^5, \dots) vs. an even degree (x^2, x^4, \dots)?

What about the roots? How can we tell if it crosses or touches the x-axis? (You can review the previous slides as you consider your answer.)

Handwritten notes:

- odd** (blue): x^1, x^3, x^5 with a graph showing a curve passing through the origin from bottom-left to top-right.
- even** (green): x^2, x^4, x^{100} with a graph showing a parabola opening upwards.
- odd** (red): $-(x^1, x^3)$ with a graph showing a curve passing through the origin from top-left to bottom-right.

Submit to Teacher

3.3 All About Behavior

A Practice Understanding Task



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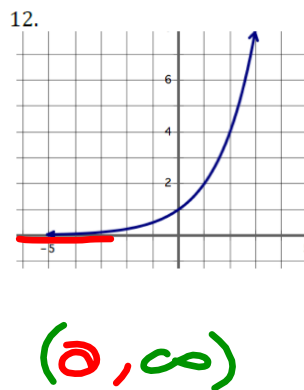
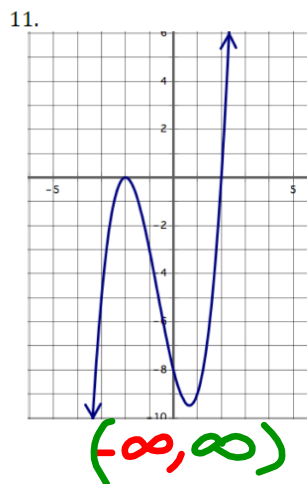
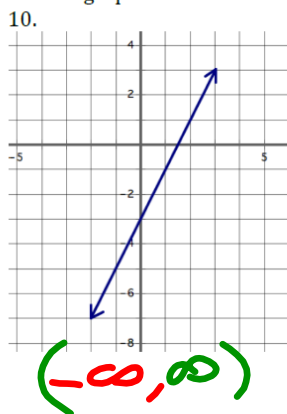


Part I: For each situation:

- Determine the function type. If it is a polynomial, also state the degree of the polynomial and whether it is an even degree polynomial or an odd degree polynomial.
- For each, state the end behavior based on your knowledge of the function
Use the format: As $x \rightarrow -\infty, f(x) \rightarrow ______$ and as $x \rightarrow \infty f(x) \rightarrow ______$

- $f(x) = 3 + 2x$ $(-\infty, \infty)$
- $f(x) = x^4 - 16$ (∞, ∞)
- $f(x) = 3^x$ $(0, \infty)$
- $f(x) = x^3 + 2x^2 - x + 5$ $(-\infty, \infty)$
- $f(x) = -2x^3 + 2x^2 - x + 5$ (∞, ∞)
- $f(x) = \log_2 x$ $(-\infty, \infty)$
- $f(x) = -2(x - 3)(x + 4)$ (∞, ∞)
- $f(x) = \sqrt{x} - 3$ $(-3, \infty)$
- $f(x) = 3(x - 1)(x + 2)(x - 4)$ $(-\infty, \infty)$

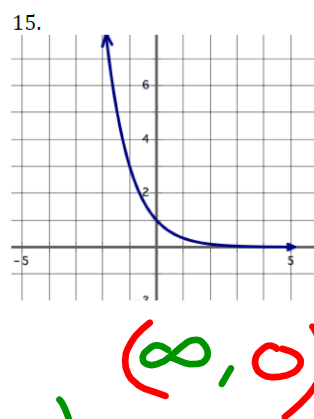
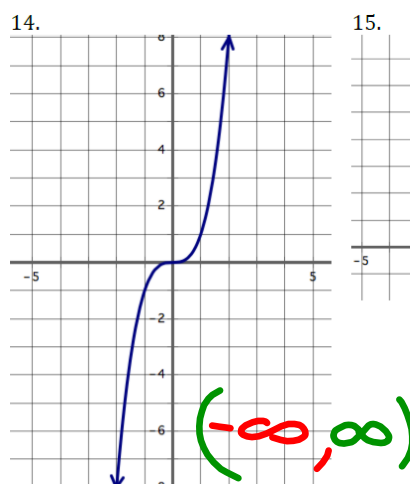
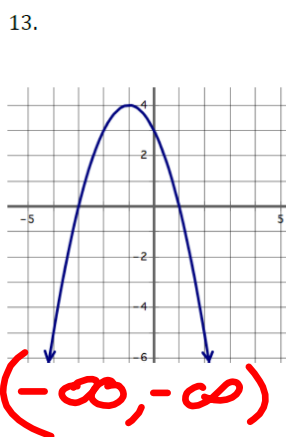
Use the graphs below to describe the end behavior of each function. Use the same format as above.



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Polynomial Equations 12



Part II: Use the functions from problems 1-18 to answer the following without finding the solution to each problem. Write a short explanation for each answer.

19. Compare problems 4 and 5: Which has the greatest value as $x \rightarrow \infty$?
20. Compare problems 6 and 12: Which has the greatest value as $x \rightarrow \infty$?
21. Compare problems 8 and 10: Which has the greatest value as $x \rightarrow \infty$?
22. Compare problems 2 and 4: Which of these two polynomials has the highest degree?
23. Compare problems 7 and 13: Which has the highest maximum value?
24. Compare problems 8 and 11: Which has the greatest average rate of change from $[15, 20]$?
25. Compare problems 12 and 14: Which grows faster as $x \rightarrow \infty$?
26. Extension: Create three comparison problems of your own (be sure you know the answer).

Name _____

Polynomial Functions **3.3**

Ready, Set, Go!

Ready

Topic: Forms of linear and quadratic functions

The different forms of linear and quadratic functions are listed below. Explain how the structure of each form gives you information about the graph of the function.



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Linear:

1. Standard form: $ax + by = c$
x & y intercept

2. Slope-intercept form: $y = mx + b$
slope y-intercept

3. Point-slope form: $y - y_1 = m(x - x_1)$
slope point (x₁, y₁)

Quadratic:

4. Standard form: $y = ax^2 + bx + c$
y-intercept

5. Factored form: $y = a(x - r_1)(x - r_2)$
x-intercepts

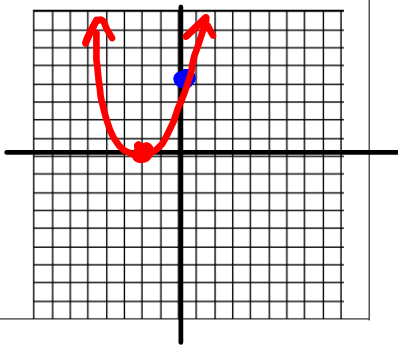
6. Vertex form: $y = a(x - h)^2 + k$
mid-line (h, k)

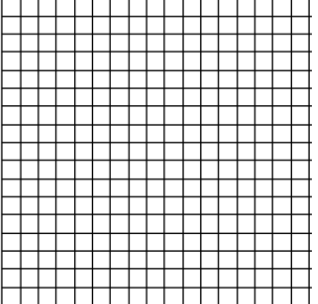
For each, write what you know about the function (including end behavior) and then graph.

<p>7. Equation: $f(x) = (x - 3)(x + 4) - 12$ <i>3 -4 -12</i></p> <p>What I know about this function: <i>parabola "U" shape cross @ 3, -4</i></p> <p>End behavior: as $x \rightarrow -\infty$, $f(x) \rightarrow \infty$ as $x \rightarrow \infty$, $f(x) \rightarrow \infty$</p>	<p>Graph:</p>
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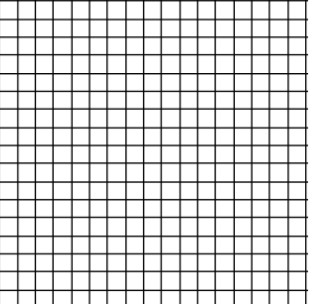
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8. Equation: $g(x) = x^2 + 4x + 4$	Graph:
<p>What I know about this function: parabola</p> <p>End behavior: as $x \rightarrow -\infty$, $g(x) \rightarrow \infty$ as $x \rightarrow \infty$, $g(x) \rightarrow \infty$</p>	

9. Equation $y = -x^2 - 1$	Graph:
<p>What I know about this function:</p> <p>End behavior: as $x \rightarrow -\infty$, $y \rightarrow ______$ as $x \rightarrow \infty$, $y \rightarrow ______$</p>	

10. Equation: $h(x) = 2(x - 3) + 1$	Graph:
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10. Equation: $h(x) = 2(x - 3) + 1$	Graph:
<p>What I know about this function:</p> <p>End behavior: as $x \rightarrow -\infty$, $h(x) \rightarrow ______$ as $x \rightarrow \infty$, $h(x) \rightarrow ______$</p>	



Set

Topic: Determine the function type and state the end behavior.

11. $f(x) = x^2 + 12x - 1$

12. $g(x) = 4 \cdot 2^x$

13. $h(x) = -x^3 + 1$

14. $p(x) = -x^2 + 3x - 1$

Use the equations above to answer the following:

- 15. Which function above has the greatest value at $x = 1,000$?
- 16. Which function above is *always* increasing?
- 17. Which function above is *always* decreasing?
- 18. Which function above has a relative maximum value?
- 19. Which function above has a relative minimum value?

~

Go

Topic: Solve for x .

20. $x^2 - 16 = 0$

22. $x^2 - 5x + 6 = 0$

24. $(x + 4)(x - 3)(x + 1) = 0$

$x = -4, 3, -1$
Topic: Multiply.
C.O.I.L.

26. $(x - 7)(x + 7)$

28. $(x - 9)(x - 9)$

21. $x^2 + 4x + 3 = 0$

23. $x^2 + 4x = 12$

25. $x(x^2 - 6x + 9) = 0$

$ax^2 + bx + c = 0$

$x^2 + 4x - 12 = 0$
 $(x + 6)(x - 2) = 0$
 $x = -6, 2$

27. $(3x - 5)(3x + 5)$

29. $(x + 1)(x + 1)$

