Name:______________________________ Period:_______

Honors Advanced Algebra

Key Concept 7—Systems and Comparing Functions—Study Guide

Solve the system using algebra.

1) $-2x + y = -1$ $\Rightarrow$ $y = 2x - 1$

$+2x \quad\quad +2x$

$y = x^2 - x - 5$ $\quad$ $y = x^2 - x - 5$

Set equal to each other. Then set equal to zero.

$\cancel{2x} - \cancel{y} = x^2 - x - 5$

$-\cancel{2x} + 1 = \quad -2x + 1$

$0 = x^2 - 3x - 4$ Factor

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

$0 = x - 4$ or $0 = x + 1$

$\boxed{4 = x}$ or $\boxed{-1 = x}$

Now, find corresponding y.

When $x = 4$:

$y = 2(4) - 1 = 7$

$\boxed{(4,7)}$

When $x = -1$:

$y = 2(-1) - 1 = -3$

$\boxed{(-1,-3)}$

2) $y = -x^2 + 4x + 5$

$y = x^2 - 2x - 3$

$-\cancel{x^2} + 4\cancel{x} + \cancel{5} = x^2 - 2x - 3$

$+\cancel{x^2} \quad -4x \quad -5 = x^2 - 4x - 5$

$0 = 2x^2 - 6x - 8$

Factor out 2.

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

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

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

$0 = x - 4$ or $0 = x + 1$

$\boxed{4 = x}$ $\quad$ $\boxed{-1 = x}$

When $x = -1$:

$y = (-1)^2 - 2(-1) - 3$

$= 1 + 2 - 3 = 0$

$\boxed{(-1,0)}$

When $x = 4$:

$y = (4)^2 - 2(4) - 3$

$= 16 - 8 - 3 = 5$

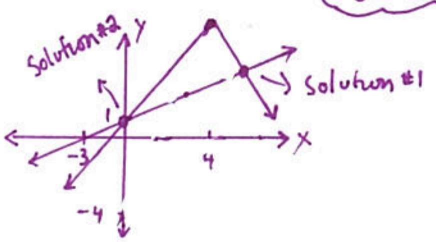
$\boxed{(4,5)}$

Solve the system by graphing.

3) $y = -|x-4| + 5$

$y = \frac{1}{3}x + 1$

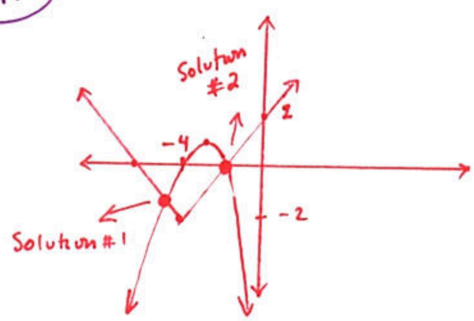
press key to the right of #9.



The linear and absolute value functions have 2 intersection points: ① $(0,1)$ ② $(6,3)$

4) $y = |x+4| - 2$

$y = -x^2 - 6x - 8$



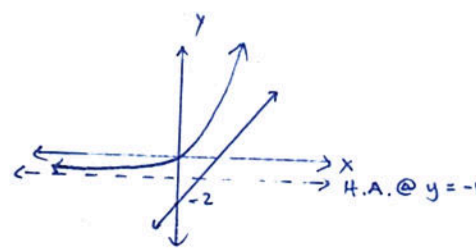
We have two solutions:

① $(-4.562, -1.434)$

② $(-2, 0)$

5) $y = 2^x - 1$

$y = \frac{3}{2}x - 2$



Again, no solution.

Identify which type of model the data represents: linear, exponential, or quadratic. Explain your reasoning.

6)

x	y
−2	9
−1	7
0	5
1	3
2	1

2, 2, 2, 2

* Difference in y-values is 2, a constant

∴ Data represents a linear model.

7)

x	y
−2	12
−1	6
0	3
1	1.5
2	0.75

6, 3, 1.5, 0.75

* Differences follow similar patter to y-values

∴ Data represents an exponential model.

8)

x	y
0	1
1	1.5
2	3
3	5.5
4	9

0.5, 1.5, 2.5, 3.5

1, 1, 1

* Second difference is constant, so the data represents a quadratic model.

9)

x	y
−2	$\frac{1}{50}$
−1	$\frac{1}{10}$
0	$\frac{1}{2}$
1	$\frac{5}{2}$
2	$\frac{25}{2}$

$\frac{2}{25}$, $\frac{2}{5}$, $\frac{4}{2} = 2$, $\frac{20}{2} = 10$

* Differences follow an exponential pattern...

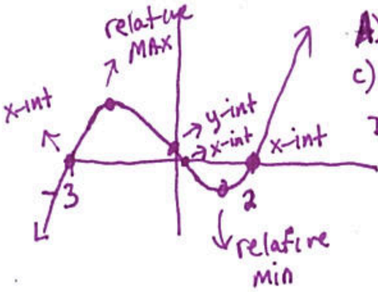
∴ Exponential.

For 10 - 15, if a letter does not appear it means N/A (not apply)

Determine which of the following features each function has and describe the feature on the function. For example, if the function has an x intercept, state where it's located too.

A) relative minimum
B) relative maximum
C) x-intercept
D) y-intercept
E) absolute minimum
F) absolute maximum
G) domain of all real numbers
H) range of all real numbers

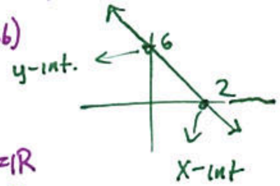
10) $y = 3x^3 + 2x^2 - 19x + 6$



B) @ (-1.692, 29.342)
A) @ (1.248, -8.766)
C) @ -3, $\frac{1}{3}$, 2
D) @ (0, 6)
G) $(-\infty, \infty) = \mathbb{R}$
H) $(-\infty, \infty) = \mathbb{R}$

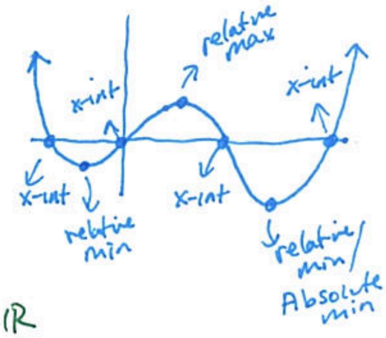
11) $3x + y = 6$

$y = -3x + 6$



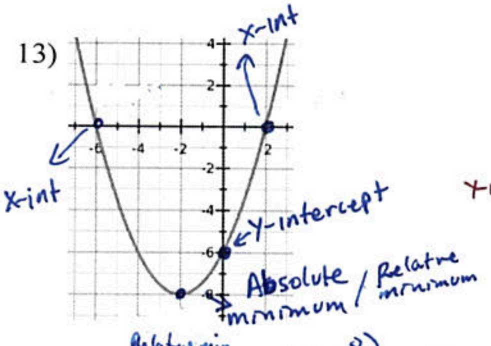
C) x-int @ (2, 0)
D) y-int @ (0, 6)
G) Domain: $(-\infty, \infty) = \mathbb{R}$
H) Range: $(-\infty, \infty) = \mathbb{R}$

12) $y = x^4 - 5x^3 + 2x^2 + 8x$



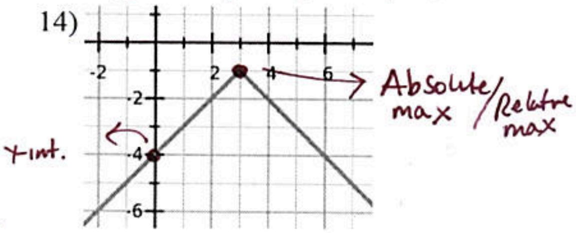
A) @ (-0.574, -2.879), (3.254, -12.950)
B) @ (1.070, 6.035)
C) @ -1, 0, 2, 4
D) @ (0, 0)
E) @ (3.254, -12.950)
G) $(-\infty, \infty) = \mathbb{R}$

13)



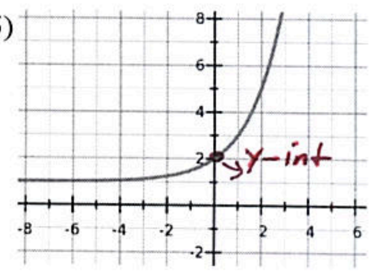
A & E) Relative min / Abs. min @ (-2, -8)
G) Domain: $(-\infty, \infty) = \mathbb{R}$
C) x-int @ (-6, 0) & (2, 0)
D) y-int @ (0, -6)

14)



D) y-int @ (0, -4)
E) Relative max/ Abs max @ (3, -1)
G) Domain: $(-\infty, \infty) = \mathbb{R}$

15)



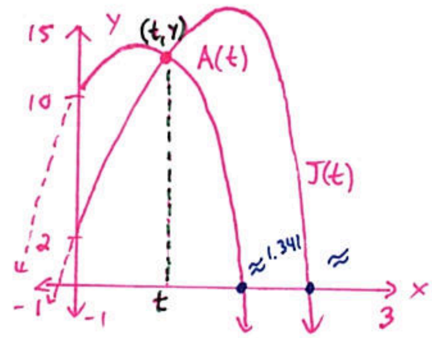
D) y-int @ (0, 2)
G) Domain: $(-\infty, \infty) = \mathbb{R}$

16) Jackie and Angie are bouncing rubber balls in the playground at school. Jackie throws her ball off the edge of a 2 foot platform at the same time Angie throws hers off the edge of a 10 foot platform. J(t) represents the height of the Jackie's ball and A(t) represents the height of Angie's ball , where t represents time in seconds in both functions. Assume $t \geq 0$ and that the balls fail to keep bouncing after they hit the ground for the first time.

$J(t) = -16t^2 + 28t + 2$ $\qquad$ $A(t) = -16t^2 + 14t + 10$

A) Graph the function.

Here's a sketch:



Window: [-1, 3] by [-1, 15]

B) Do the rubber balls ever reach identical heights after the same number of seconds when leaving the platform? If so, after how many seconds and at what height does it happen?

Yes, this happens at point (t, A(t) = J(t))
The balls reach the same height of ≈ 12.776 ft at about 0.571 seconds.

C) Whose ball hits the ground first and by how many seconds?

Angie's ball hits the ground after ≈ 1.341 sec.
Jackie's ball hits the ground after ≈ 1.819 sec.
∴ Angie's ball hits the ground 1st by about 0.478 seconds.