

1. The Metropolis Zoo recently celebrated the birth of two new baby pandas!

Mochi the panda cub has been measured and weighed each week since she was born.	
Weeks	Weight
0	1
1	5
2	9
3	13

$m = 4$

Mochi's brother is Kappa. His weight has been charted on the graph below.	
Time in weeks	Weight in pounds
0	2
1	5
2	8
3	11
4	14

$m = \frac{3}{1}$

- a) Which panda was heavier when they were born? b) Which panda is growing faster? c) Which panda will weigh more at 5 weeks?
- Kappa Mochi Mochi
- Mochi $\rightarrow y = 4(5) + 1 = 21$
Kappa $\rightarrow y = 3(5) + 2 = 17$

2. Sally and Sam are testing out their new potato shooters from their tree houses which are at different heights. The table shows the time, t , in seconds and height, $h(t)$, in meters of the potato pieces shot from Sam's shooter. The time, t , and height, $H(t)$, of Sally's potato shooter can be represented by the following equation.

Sally's Shooter:

$$H(t) = -t^2 + 4t + 5$$

Sam's Shooter:

$$y = -2x^2 + 5x + 7$$

t	0	0.5	1	1.5	2	2.5	3	3.5
h(t)	7	9	10	10	9	7	4	0

a) Whose potato pieces went higher? Find Sally's vertex by completing the square. Use your calculator to find Sam's.

max sally: 9

max sam: 10.125

$$y = -t^2 + 4t + 5$$

$$-y = t^2 - 4t - 5$$

$$+5 \quad +4 \quad +4$$

$$y = -(t-2)^2 + 9$$

$V(1.25, 10.125)$

b) Whose potato pieces stayed in the air longer, Sally's or Sam's? Show your work below and then justify your answer.

SALLY: $-t^2 + 4t + 5 = 0$
 $-(t^2 - 4t - 5) = 0$
 $-(t-5)(t+1) = 0$
 $t = 5$

SAM: $-2x^2 + 5x + 7 = 0$
 $-(2x^2 - 5x - 7) = 0$
 $-(2x-7)(x+1) = 0$
 $x = 3.5$

$3.5 < 5$ for Sally

3. City A had a population of 18,850 people in 2010, and has been growing 8% each year. City B has been growing according to the following tables of values. City C has been decreasing in population according to the following model where t represents the number of years since 2010 $P(t) = 72000(0.97)^t$.

Years since 2010	Population City B
0	22,540
1	23,667
2	24,850

City A = $18850(1.08)^t$ B/W Year 12 & 13
 City B = $22540(1.05)^t$ B/W Year 16 & 17
 City C = $72000(0.97)^t$ B/W Year 11 & 12

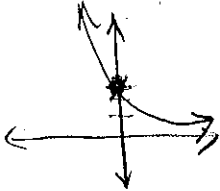
Which city will reach a population of 50,000 people first? In what year will this occur?

City C, during year 11 (between start of year 11 & start of year 12)

For each of the following identify functions identify the key features listed.

4. $y = 3(0.5)^x$

Sketch:



y-intercept:

$(0, 3)$

Rate of growth/decay:

0.50

Domain:

\mathbb{R}

Range:

$\mathbb{R}, y > 0$

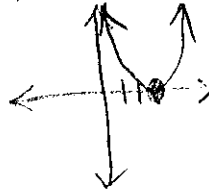
End Behavior:

As $x \rightarrow \infty, y \rightarrow 0$

As $x \rightarrow -\infty, y \rightarrow \infty$

5. $y = (x-3)^2$

Sketch:



y-intercept:

$(0, 9)$

x-intercept(s):

$(3, 0)$

Vertex:

$V(3, 0)$

End Behavior:

As $x \rightarrow \infty, y \rightarrow \infty$

As $x \rightarrow -\infty, y \rightarrow \infty$

Domain:

\mathbb{R}

Range:

$\mathbb{R}, y \geq 0$

What is the parent function?

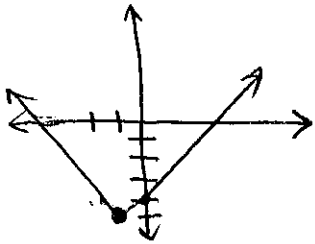
$y = x^2$

How has the parent function been shifted?

right 3 units

6. $y = |x + 1| - 5$

Sketch:



y-intercept:

$(0, -4)$

$|0+1|-5 = 1-5 = -4$

End Behavior:

As $x \rightarrow \infty, y \rightarrow \infty$

As $x \rightarrow -\infty, y \rightarrow \infty$

Domain:

\mathbb{R}

Range:

$\mathbb{R}, y \geq -5$

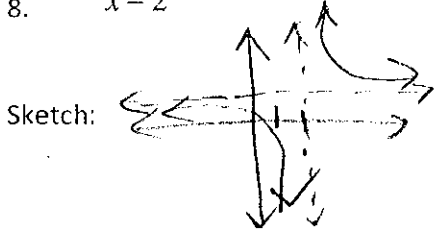
What is the parent function?

$y = |x|$

How has the parent function been shifted?

down 5 units
left 1 unit

8. $y = \frac{9}{x-2} + 1$



y-intercept: $\frac{9}{0-2} + 1 = -4.5 + 1 = -3.5$
 $(0, -3.5)$

Horizontal Asymptote: $y = 1$ Vertical Asymptote: $x = 2$

$y = 1$

$x = 2$

Domain:

Range:

$\mathbb{R}, x \neq 2$

$\mathbb{R}, y \neq 1$

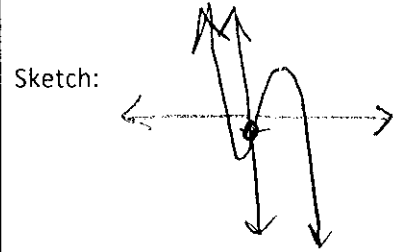
What is the parent function?

How has the parent function been shifted?

$y = \frac{9}{x}$

up 1 unit
right 2 units

9. $y = -2x^3 + 2x^2 + 4x - 1$



y-intercept: $(0, -1)$ x-intercept(s): $\approx (1.23, 0)$ and $\approx (-1.1, 0)$
 $\approx (2.3, 0)$

End Behavior:

As $x \rightarrow \infty$, $y \rightarrow -\infty$

As $x \rightarrow -\infty$, $y \rightarrow \infty$

Domain:

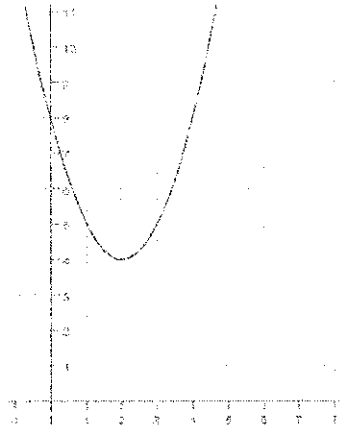
Range:

\mathbb{R}

\mathbb{R}

Is the function odd, even or neither? **neither**

10.



The graph to the left is a translation of the parent function $f(x) = x^2$

y-intercept: $(0, 8)$

End Behavior:

As $x \rightarrow \infty$, $y \rightarrow \infty$

Vertex: $V(2, 4)$

As $x \rightarrow -\infty$, $y \rightarrow \infty$

Domain: \mathbb{R}

Range: $\mathbb{R}, y \geq 4$

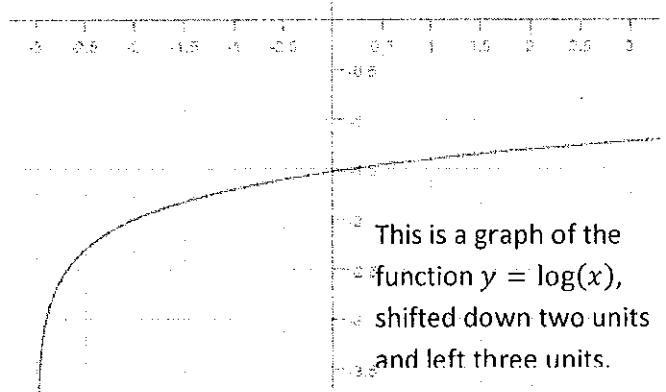
How has the parent function been shifted?

up 4, right 2

Equation:

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

11.



This is a graph of the function $y = \log(x)$, shifted down two units and left three units.

Vertical Asymptote: $x = -3$

End Behavior:

As $x \rightarrow \infty$, $y \rightarrow \infty$

As $x \rightarrow -3$, $y \rightarrow -\infty$

Domain:

Range:

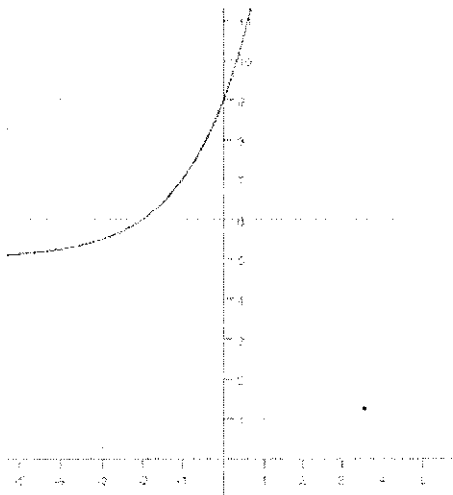
$\mathbb{R}, x > -3$

\mathbb{R}

Equation:

$y = \log(x+3) - 2$

12.



The graph to the left is a translation of the parent function $f(x) = 4(2)^x$

y-intercept: $(0, 9)$

End Behavior:

As $x \rightarrow \infty, y \rightarrow \infty$

As $x \rightarrow -\infty, y \rightarrow 5$

Domain:

\mathbb{R}

Range:

$\mathbb{R}, y > 5$

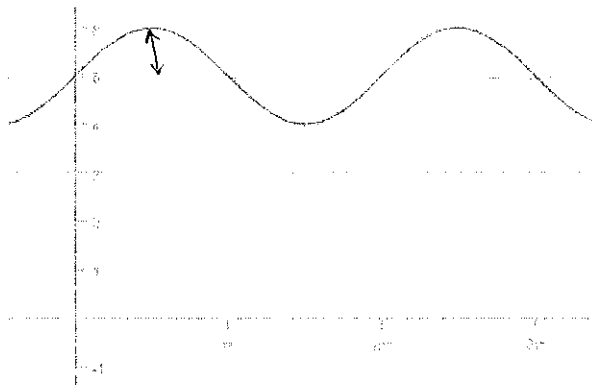
How has the parent function been shifted?

up 5 units

Equation:

$$f(x) = 4(2)^x + 5$$

13.



y-intercept: $(0, 5)$

Period: 2π

Amplitude: 1

Midline: $y = 5$

Domain: \mathbb{R}

Range: $\mathbb{R}, 6 \leq y \leq 4$

What is the parent function?

$y = \sin(x)$

How has the parent function been shifted?

up 5 units

Equation:

$$y = \sin(x) + 5$$

13. Use the graph to the right.

Domain: \mathbb{R}

Range: $\mathbb{R}, y \leq 2$

Interval(s) of Increase: $(-\infty, -2) \cup [0, 2]$

Interval(s) of Decrease: $[-2, 0]$

