

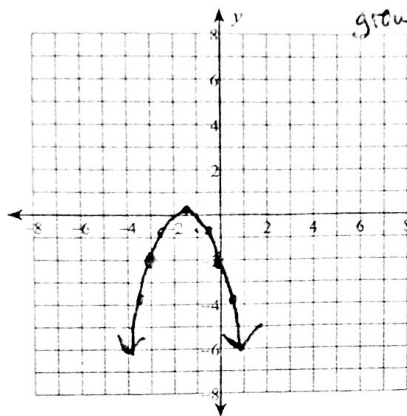
Unit 3 REVIEW

Identify the vertex, axis of symmetry, min/max value, y-intercept, and x-intercepts of each. Then sketch the graph.

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

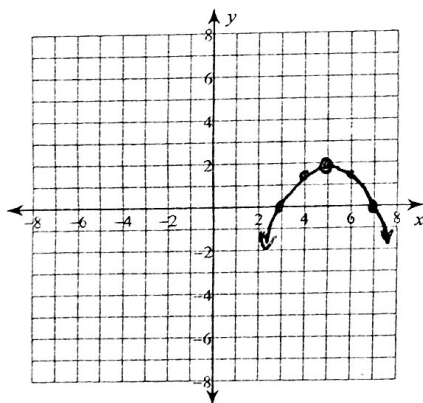
* A lot of these graphs do not have pretty growth rates. Instead

of using $1a, 3b, 5c$ to graph, you can use the vertex, x-intercepts, and the y-intercept. Once you have the y-int, you can reflect it over the axis of symmetry.



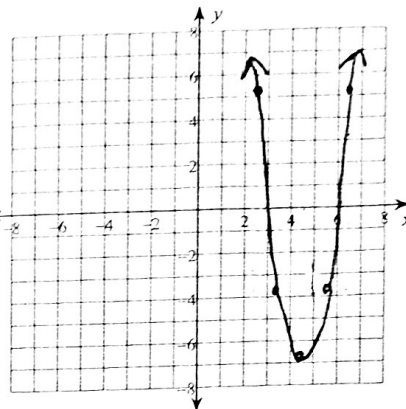
- Vertex: $(-1.5, 2.5)$
- AoS: $x = -1.5$
- Max value: 2.5
- y-int: $(0, -2)$
- x-int: $(-2, 0), (-1, 0)$

3) $y = -\frac{1}{2}(x-5)^2 + 2$



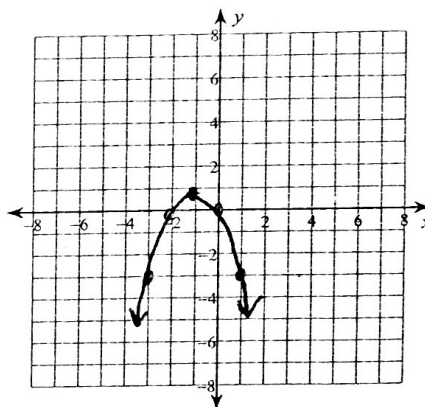
- Vertex: $(5, 2)$
- AoS: $x = 5$
- Max value: 2
- y-int: $(0, -10.5)$
- x-int: $(7, 0), (3, 0)$

2) $y = 3x^2 - 27x + 54$



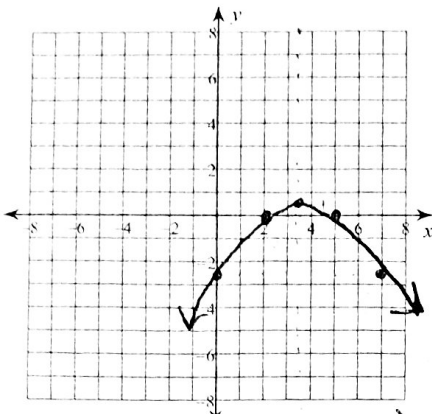
- Vertex: $(4.5, -6.75)$
- AoS: $x = 4.5$
- Min value: -6.75
- y-int: $(0, 54)$
- x-int: $(6, 0), (3, 0)$

4) $y = -(x+1)^2 + 1$



- Vertex: $(-1, 1)$
- AoS: $x = -1$
- Max value: 1
- y-int: $(0, 0)$
- x-int: $(0, 0), (-2, 0)$

$$5) y = -\frac{1}{4}(x-5)(x-2)$$



Vertex: $(3.5, 0.5625)$
 AOS: $x = 3.5$
 Max value: 0.5625
 y-int: $(0, -2.5)$
 x-int: $(5, 0), (2, 0)$

Describe the transformations necessary to transform the graph of $f(x)$ into that of $g(x)$.

$$7) f(x) = x^2$$

$$g(x) = -\frac{1}{3}x^2$$

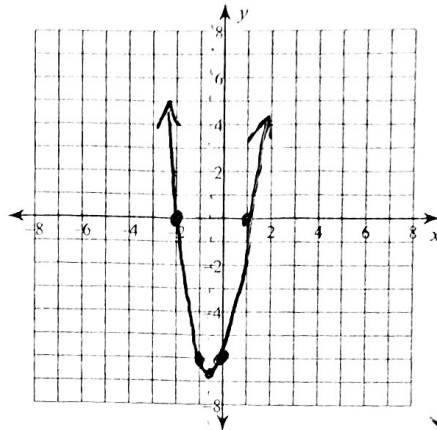
Reflection over x-axis
 Vertical compression by factor
 of $\frac{1}{3}$

$$9) f(x) = |x|$$

$$g(x) = -|x+3|$$

Reflection over x-axis
 Shift left 3

$$6) y = 3(x-1)(x+2)$$



Vertex: $(-0.5, -6.75)$
 AOS: $x = -0.5$
 Min value: -6.75
 y-int: $(0, -6)$
 x-int: $(1, 0), (-2, 0)$

$$8) f(x) = x^2$$

$$g(x) = 3(x+3)^2$$

Vertical stretch by factor of 3
 Shift left 3

$$10) f(x) = x^2$$

$$g(x) = 2(x-3)^2$$

Vertical stretch by factor of 2
 Shift right 3

Transform the given function $f(x)$ as described and write the resulting function as an equation.

$$11) f(x) = |x|$$

translate right 1 unit
 translate down 1 unit

$$g(x) = |x-1|-1$$

$$12) f(x) = x^2$$

reflect across the x-axis
 translate down 1 unit

$$g(x) = -x^2 - 1$$

- 13) $f(x) = |x|$
translate right 3 units
translate down 1 unit

$$g(x) = |x-3| - 1$$

- 14) $f(x) = |x|$
reflect across the x-axis
translate up 2 units

$$g(x) = -|x| + 2$$

Use the information provided to write the STANDARD form equation of each parabola.

15) $y = -2(x-8)^2 - 8$

$$y = -2x^2 + 32x - 136$$

16) $y = 2(x+9)(x+3)$

$$y = 2x^2 + 24x + 54$$

Use the information provided to write the VERTEX form equation of each parabola.

17) $y = \frac{1}{3}x^2 - \frac{2}{3}x + \frac{1}{3}$

$$y = \frac{1}{3}(x-1)^2$$

18) $y = -(x+8)(x+2)$

$$y = -(x+5)^2 + 9$$

- 19) Opens up or down, Vertex: $(-5, 6)$, Passes through: $(-6, 21)$

$$y = 15(x+5)^2 + 6$$

- 20) Opens up or down, Vertex: $(-2, 0)$, Passes through: $(0, -32)$

$$y = -8(x+2)^2$$

Use the information provided to write the INTERCEPT form equation of each parabola.

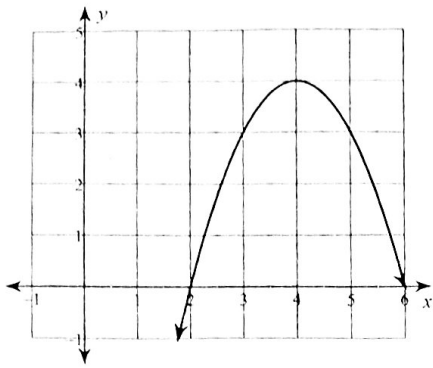
21) $y = \left(x - \frac{7}{2}\right)^2 - \frac{9}{4}$

$$y = (x-5)(x-2)$$

22) $y = 2x^2 + 6x - 56$

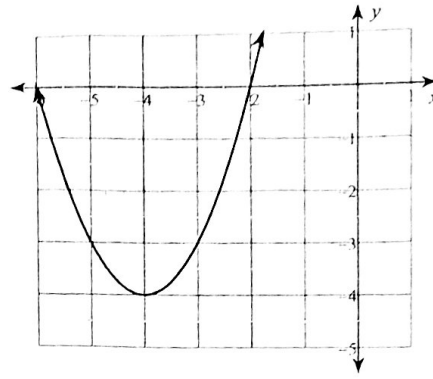
$$y = 2(x-4)(x+7)$$

23)



$$y = -(x-6)(x-2)$$

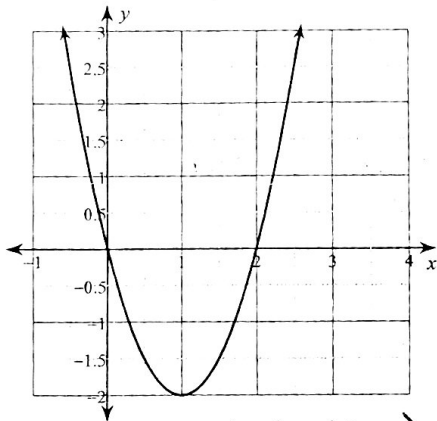
24)



$$y = (x+6)(x+2)$$

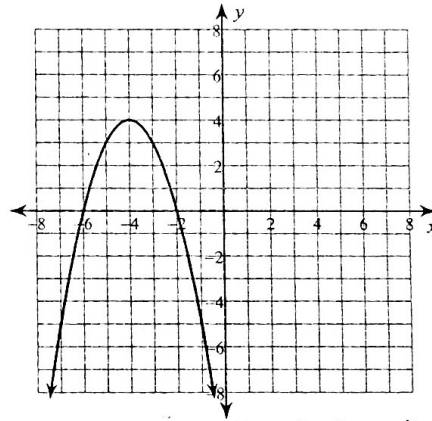
Given the following graphs, identify the following: (Approximate and/or use interval notation where necessary)

25)



- x-intercept(s): $(0, 0), (2, 0)$
- y-intercept: $(0, 0)$
- axis of symmetry: $x = 1$
- vertex: $(1, -2)$
- Max/Min Value? -2
- Domain: $(-\infty, \infty)$
- Range: $[-2, \infty)$
- Increasing: $(1, \infty)$
- Decreasing: $(-\infty, 1)$
- Direction of Opening? \cup

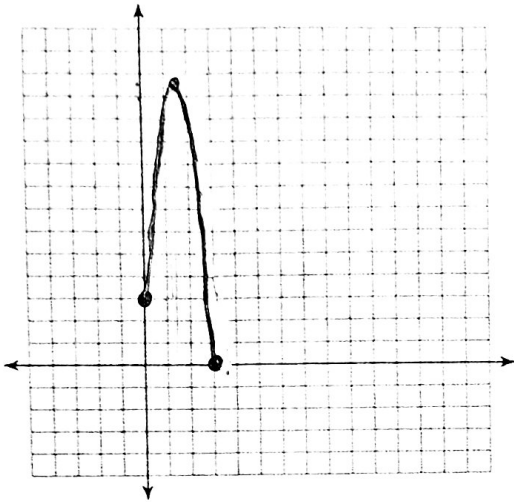
26)



- x-intercept(s): $(-6, 0), (-2, 0)$
- y-intercept: $(0, -12)$
- axis of symmetry: $x = -4$
- vertex: $(-4, 4)$
- Max/Min Value? 4
- Domain: $(-\infty, \infty)$
- Range: $(-\infty, 4]$
- Increasing: $(-\infty, -4)$
- Decreasing: $(-4, \infty)$
- Direction of Opening? \cap

Remember for each problem to decide which key feature you are trying to find in order to answer the question.

1. A ball is thrown straight up, from 3 m above the ground, with a velocity of 14 m/s. This situation can be modeled by the function $h(t) = -5t^2 + 14t + 3$, where h is the height of the ball in meters and t is the time in seconds. Graph this function below.



- a. What is a reasonable domain and range for this situation?

$$D: [0, 3] \quad R: [0, 12.8]$$

- b. When will the ball hit the ground?

3 seconds

- c. What will be the max height of the ball?

12.8 m

2. Jason jumped off a cliff into the ocean in Acapulco while vacationing with his family. His height as a function of time could be modeled by the function $h(t) = -16t^2 + 16t + 480$, where t is the time in seconds and h is the height in feet.

- a. How long did it take for Jason to reach his maximum height?

1 second

- b. What was the highest point that Jason reached?

480 ft

- c. Jason hit the water after how many seconds?

6 seconds

- d. What is a reasonable domain and range for this situation?

$$D: [0, 6] \quad R: [0, 480]$$

3. You and a friend are hiking in the mountains. You want to climb to a ledge that is 20 feet above you. The height of the grappling hook you throw is given by the function $h(t) = -16t^2 + 32t + 5$.

a. Can you throw the grappling hook high enough to reach the ledge? Why or why not?

Yes, the max height you can throw is 21 ft.

b. What about the 25 foot ledge above that? Can you throw the grappling hook high enough to reach that ledge? Why or why not?

No, the max height you can throw is 21 ft.

c. In the context of this problem, what does the 5 represent in the equation above?

The starting height of the grappling hook.

4. You are trying to dunk a basketball. You need to jump 2.5 feet in the air to dunk the ball. The height that your feet are above the ground is given by the function $h(t) = -16t^2 + 12t$.

a. What is a reasonable domain and range for this situation?

$$D: [0, 0.75]$$

$$R: [0, 2.25]$$

b. Will you be able to dunk the basketball? Why or why not?

No, the highest you can jump is 2.25 ft.