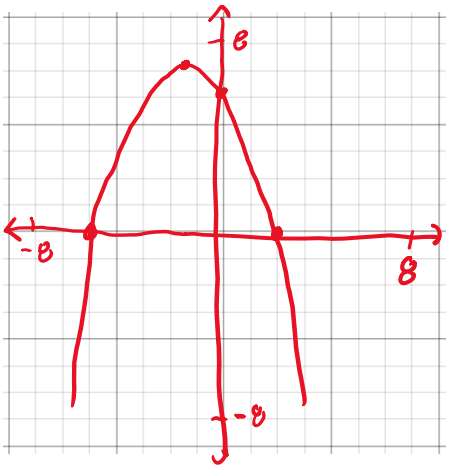
Name: Answer Key

Kwadratycks Reevyou

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



Does it open up or down? Down

Is it fatter or skinnier than $y = x^2$? fatter

Find:

x intercepts: 2 and −5

Axis of symmetry: $\frac{2+-5}{2} = -1.5$ → $x = -1.5$

y intercept:

$y = -\frac{1}{2}(x-2)(x+5)$ $y = -\frac{1}{2}(x^2-2x+5x-10)$ $y = 5$

$= -\frac{1}{2}(x^2+3x-10) = -\frac{1}{2}x^2 - \frac{3}{2}x + 5$

Vertex:

$y = -\frac{1}{2}(-1.5-2)(-1.5+5)$

$y = -\frac{1}{2}(-3.5)(3.5) = 6.125$

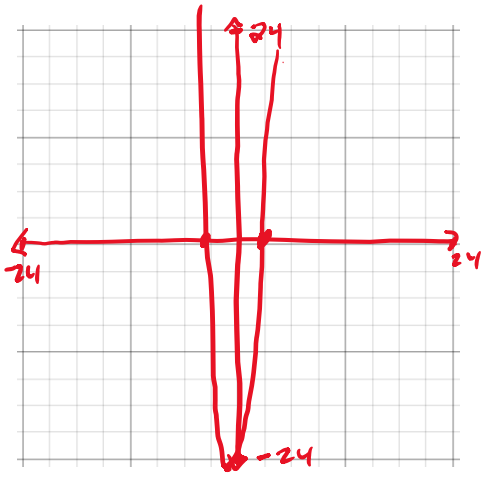
Vertex: $(-1.5, 6.125)$

Graph it!

Domain: $x \in \mathbb{R}$

Range: $y \in \mathbb{R}, y \leq 6.125$

2. $y = 2x^2 + 2x - 24$



Does it open up or down? up

Is it fatter or skinnier than $y = x^2$? skinnier

Find:

$y = 2(x^2 + x - 12)$

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

x intercepts:

$x = 3$ and -4

Axis of symmetry: $\frac{3+-4}{2} = -\frac{1}{2}$

y intercept:

$y = -24$

Vertex:

$y = 2(-\frac{1}{2}-3)(-\frac{1}{2}+4)$

$= -24.5$ $(-0.5, -24.5)$

Graph it!

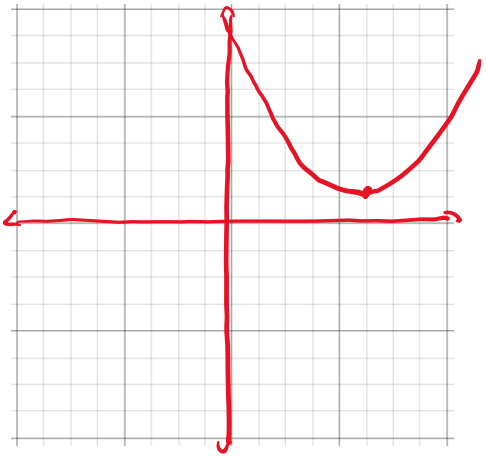
Domain: $x \in \mathbb{R}$

Range: $y \in \mathbb{R}, y \leq -24.5$

3. $y = \frac{1}{4}(x-5)^2 + 1$

Does it open up or down? up

Is it fatter or skinnier than $y = x^2$? fatter



Graph it!

Find:

Axis of symmetry: $x = 5$

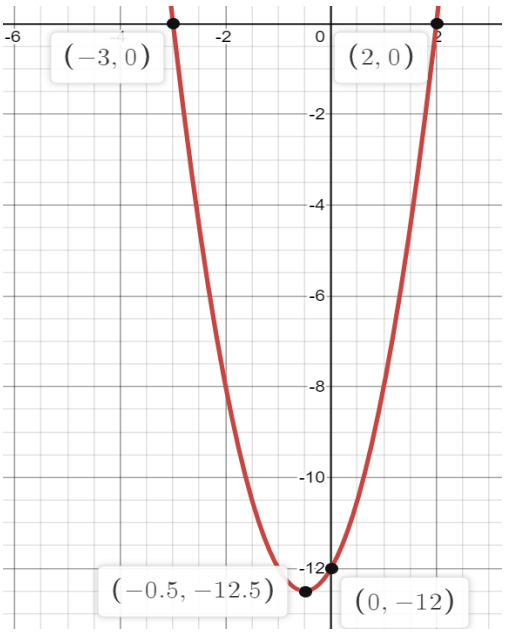
y intercept: $y = \frac{1}{4}(0-5)^2 + 1$
$= \frac{1}{4}(25) + 1 = 7.25$

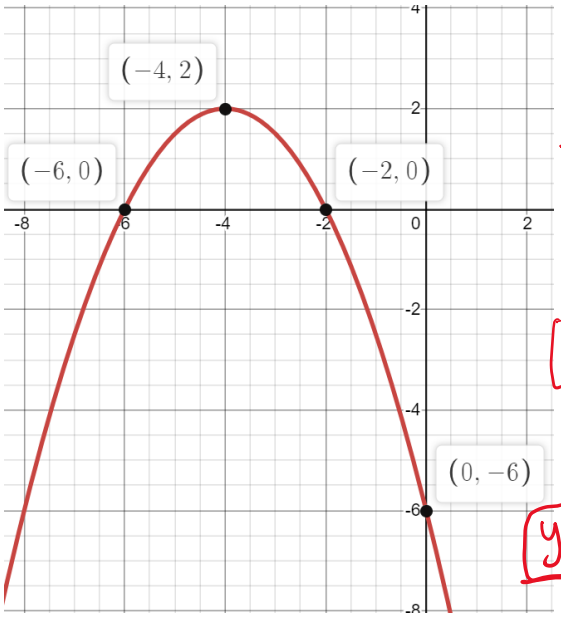
Vertex: $(5, 1)$

Domain: $x \in \mathbb{R}$

Range: $y \in \mathbb{R}$ $y \geq 1$

4. Find the equations for the following graphs in
   - Factored form and
   - Vertex form





$y = a(x+6)(x+2)$
$-6 = a(6)(2)$
$\frac{-6}{12} = \frac{a(12)}{12}$
$-\frac{1}{2} = a$
$y = -\frac{1}{2}(x+6)(x+2)$

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

$y = a(x+3)(x-2)$
$-12 = a(3)(-2)$
$\frac{-12}{-6} = \frac{a(-6)}{-6}$
$2 = a$
$y = 2(x+3)(x-2)$

$y = a(x+0.5)^2 - 12.5$
$-12 = a(0.5)^2 - 12.5$
$-12 = a(0.25) - 12.5$
$+12.5 \quad +12.5$
$\frac{0.5}{0.25} = \frac{a(0.25)}{0.25}$
$a = 2$
$y = 2(x+\frac{1}{2})^2 - 12.5$

5. A grasshopper jumps off a rock and his path is modeled by the equation

$$h = -2t^2 + 7t + 12$$

where *h* is the height in centimetres and *t* is the time in seconds.

a) How long is the grasshopper in the air?

Desmos: find x intercepts

→ 4.76 s.

b) What is the highest point of his leap?

Desmos: find y coordinate of vertex

18.125 cm

c) How high is the rock?

y intercept: 12 cm

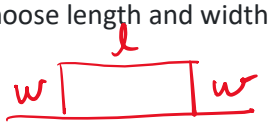
d) When is it 10 cm above the ground?

also graph $y = 10$ & find intersection

3.7665

6. A farmer wants to make a rectangular pen for his sheep. He has 60m fencing material to cover three sides with the other side being a brick wall. He wants to use the fencing material to maximize the space for his sheep. How should he choose length and width of the pen to achieve his objective?

Let l = length
w = width



$l + 2w = 60$

$l = 60 - 2w$

$A = l \times w$

$= (60 - 2w)w = 60w - 2w^2$

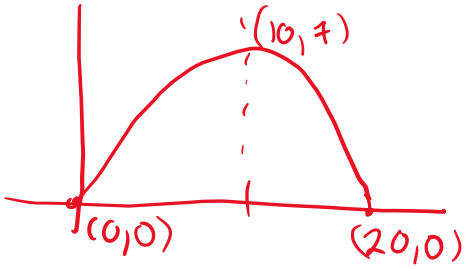
Use Desmos to graph

Vertex gives max.

Max area = $450 m^2$ when width = 15m

So $\frac{450}{15} = 30m$ = length

7. A kangaroo kicks a ball and it lands 20 metres from where he kicked it. If it reaches a maximum height of 7 m, write an equation to model the path of the ball.



$y = a(x-0)(x-20)$

$y = ax(x-20)$

Sub in vertex

$7 = a(10)(10-20)$

$7 = a(10)(-10)$

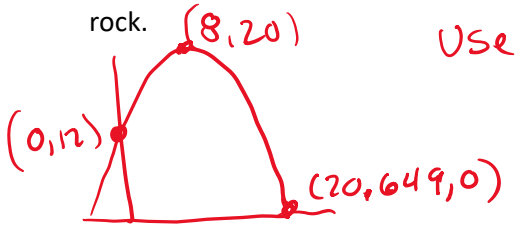
$\frac{7}{-10} = \frac{a(-100)}{-10}$

$a = \frac{-7}{100}$ or -0.07

Equation:

$y = \frac{-7}{100}x(x-20)$

8. Anton throws a rock off a 12 m cliff. It reaches a maximum height of 20 m from the bottom of the cliff when it is 8 m from the base of the cliff. Write an equation to model the path of the rock.



Use vertex form: $y = a(x-8)^2 + 20$

Sub in y intercept

$12 = a(0-8)^2 + 20$

$12 = a(64) + 20$

$-20 \quad -20$

$\frac{-8}{64} = \frac{a(64)}{64}$ $a = -\frac{1}{8}$

Equation: $y = -\frac{1}{8}(x-8)^2 + 20$

How far from the base of the cliff does it land?

looking for x intercept ($y=0$)

use Desmos:

20.649 m from base of cliff

9. Use the quadratic formula to solve the following equations:

a) $2x^2 + 7x + 4 = 0$

$y = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-7 \pm \sqrt{7^2-4(2)(4)}}{2(2)}$

$= \frac{-7 \pm \sqrt{49-32}}{4}$

$= \frac{-7 \pm \sqrt{15}}{4}$

So $x = \frac{-7+\sqrt{15}}{4}$ or $\frac{-7-\sqrt{15}}{4}$

$(-0.782$ or $-2.718)$

b) $-3x^2 - 7x + 25 = 0$

$y = \frac{7 \pm \sqrt{(-7)^2 - 4(-3)(25)}}{2(-3)}$

$= \frac{7 \pm \sqrt{49+300}}{-6}$

$= \frac{7 \pm \sqrt{349}}{-6}$

So $y = \frac{7+\sqrt{349}}{-6}$ or $\frac{7-\sqrt{349}}{-6}$

$(4.28$ or $1.947)$