

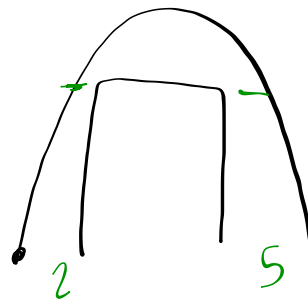
Task A

1. You kick a soccer ball from the ground into the air. The path of the ball is given by the equation: $h = -2t^2 + 14t - 20$, where h is the height of the ball above a nearby building in meters, and t is time in seconds.
- a) How many seconds does it take for the ball to reach the height of the nearby building?

$$h = -2(t^2 - 7t + 10)$$

$$h = -2(t - 5)(t - 2)$$

- ball reaches height of building after 2 + 5 seconds



- b) What is the maximum height of the soccer ball?

x-value vertex: $\frac{2+5}{2} = 3.5 \text{ s}$

y-value: $h = -2(3.5)^2 + 14(3.5) - 20$

$$h = -2(12.25) + 49 - 20$$

$$h = -24.5 + 49 - 20$$

$$h = 4.5$$

max height is 4.5m

c) How many seconds does it take for the ball to reach its highest point?

from b, it takes 3.5s

d) How tall is the nearby building?

$$h = -2t^2 + 14t - 20$$

initial height = -20

Ball starts 20m below building, \therefore building is 20m tall.

Task B

1. Label each model as quadratic, linear, or neither. *Explain* your choice.

a) $y = 5 - x^2$

- quadratic
- has x^2

b)

X	Y
3	4
4	11
5	20
6	31
7	44

+7 } +2
+9 } +2
+11 } +2
+13 } +2

- quadratic
- second differences are constant

c) $t = 3(4 - d)$

- linear
- has only one variable
- goes into $y = mx + b$ form

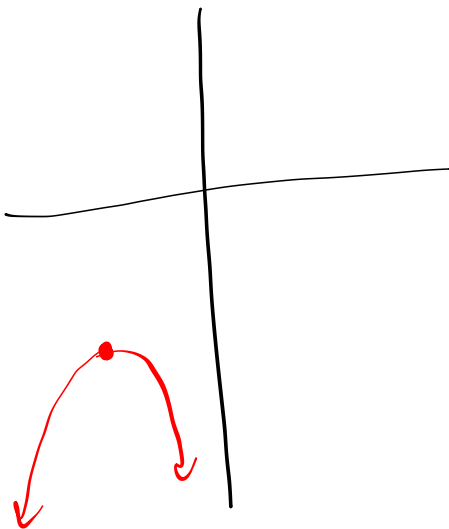
2. a) Mark looks at the equation: $y = 0.5(x - 4)(x + 5)$. He says its zeros are at -4 and 5, it opens down, and it is really skinny compared to the basic parabola. Do you agree or disagree with Mark? *Explain.*

zeros are 4 and -5

opens up $\rightarrow a$ is +0.5 (positive)

it's fatter (a is a decimal)

- b) Laine looks at the equation: $y = -3(x + 4)^2 - 9$. She says that she knows this parabola has no zeros. Do you agree or disagree with Laine? *Explain.*



Because the vertex is below x-axis and it opens down, it has no zeros.

Task C

1. Complete the table by writing the equation for each parabola:

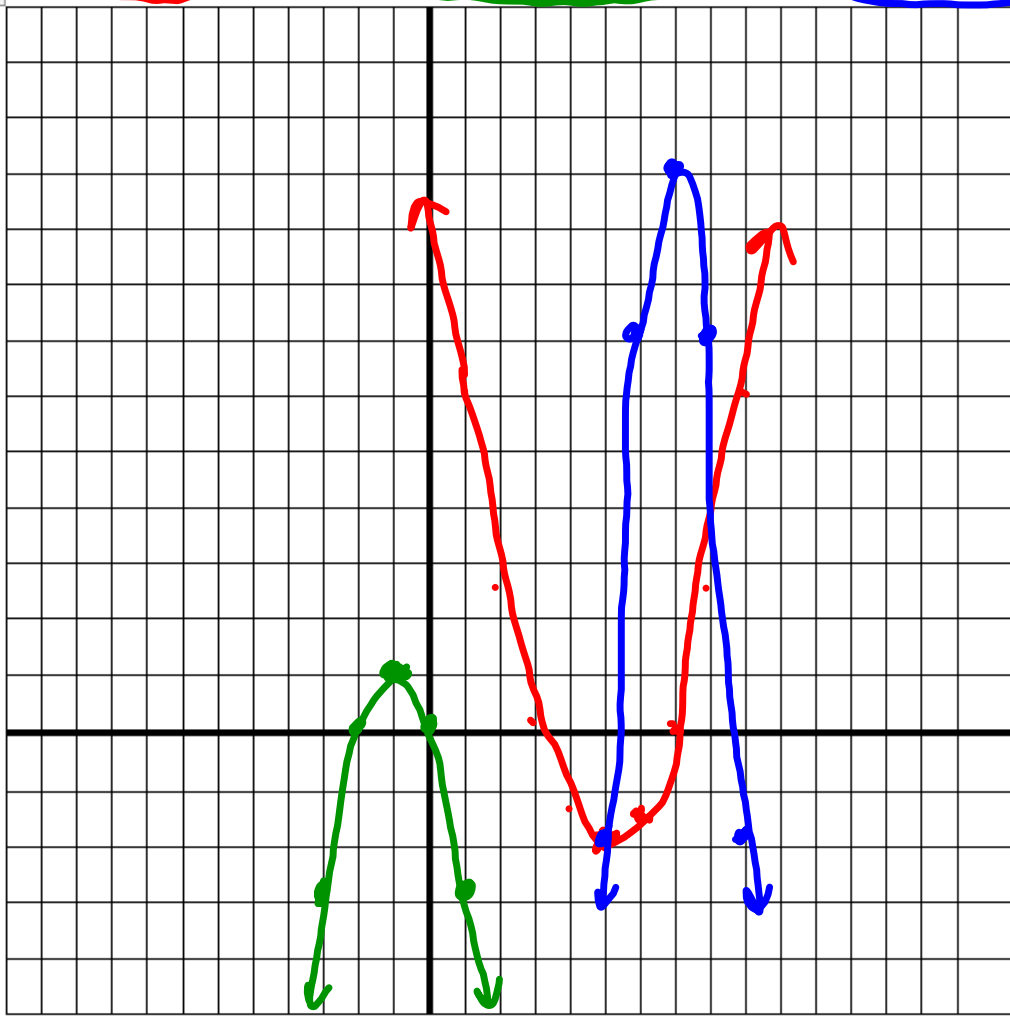
Equation	Vertex	Step pattern	Description of Transformations
$y = 2(x-0)^2 - 18$	(0, -18)	2, 6, 10	vertical stretch by 2 down 18
$y = -3(x-11)^2 + 12$	(11, 12)	-3, -9, -15	flipped on x-axis vertical stretch by 3 right 11, up 12

2. Graph and LABEL the following three quadratics:

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

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

(c) $y = -3(x-7)^2 + 10$



Task D

1. A dance club has a \$5 cover charge and averages 300 customers on Friday nights. Over the past several months, the club has changed the cover price several times to see how this affects the number of customers. For every increase of \$0.50 in the cover charge, the number of customers decreases by 30.

a) Determine the cover charge that maximizes revenue.

y is revenue
 x is # of increases

price people
 $y = (5 + 0.50x)(300 - 30x)$

Zeros: $5 + 0.50x = 0$

$$\frac{0.50x}{0.50} = \frac{-5}{0.50}$$

$$x = -10$$

$300 - 30x = 0$

$$\frac{-30x}{-30} = \frac{-300}{-30}$$

$$x = 10$$

vertex

$$\frac{-10 + 10}{2} = 0$$

\therefore 0 price increase of \$5 cover

- b) Write a quadratic equation, in vertex form, to model this situation. (* don't forget, revenue is the dependent variable and # of \$0.50 increases is the independent variable).

$$y = (5 + 0.50x)(300 - 30x)$$

