

Unit 11: Equations and Inequalities of First and Second Degree Functions

- Quadratic function inequalities
- word questions
- characteristics of functions

- 1st degree
 - linear function
- $$y = mx + b$$

- 2nd degree
- quadratic function

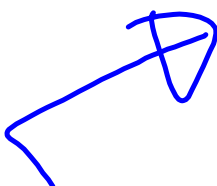
$$y = ax^2 + bx + c$$

$$y = a(x-h)^2 + k$$

$V(h, k)$

$$y = a(x-x_1)(x-x_2)$$

$$\left. \begin{array}{l} x\text{-ints } (x_1, 0) \\ (x_2, 0) \end{array} \right\}$$



graph the following inequality

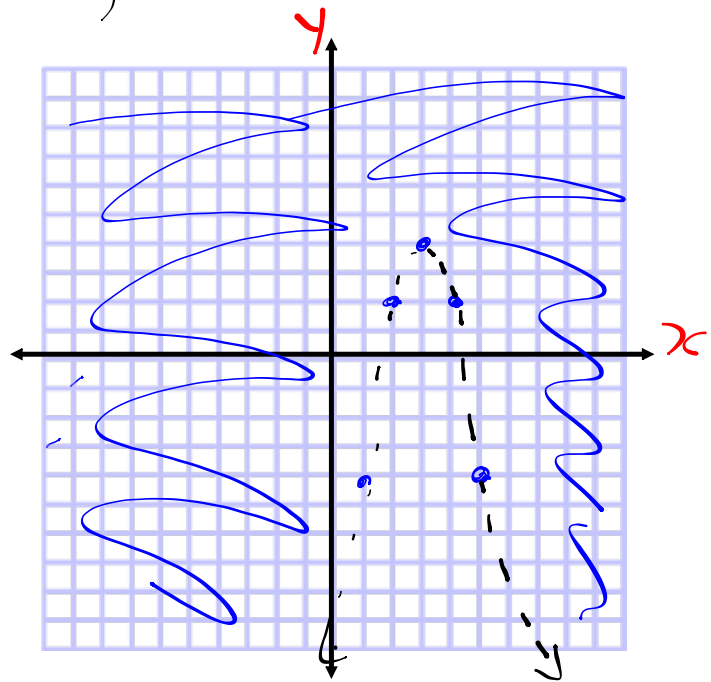
$$y > -2(x-3)^2 + 4$$

$$y = a(x-h)^2 + k$$

$$V(3, 4)$$

① graph $y = -2(x-3)^2 + 4$

x	y
1	$-2(1-3)^2 + 4 = -4$
2	$-2(2-3)^2 + 4 = 2$
3	4
4	$-2(4-3)^2 + 4 = 2$
5	$-2(5-3)^2 + 4 = -4$



② For the shading, sub in a test point $(0, 0)$ and see if it makes a true statement.

$$(0, 0)$$

$$y > -2(x-3)^2 + 4$$

$$0 > -2(0-3)^2 + 4$$

$$0 > -18 + 4$$

$0 > -14$ True, so shade where the test point is.

graph

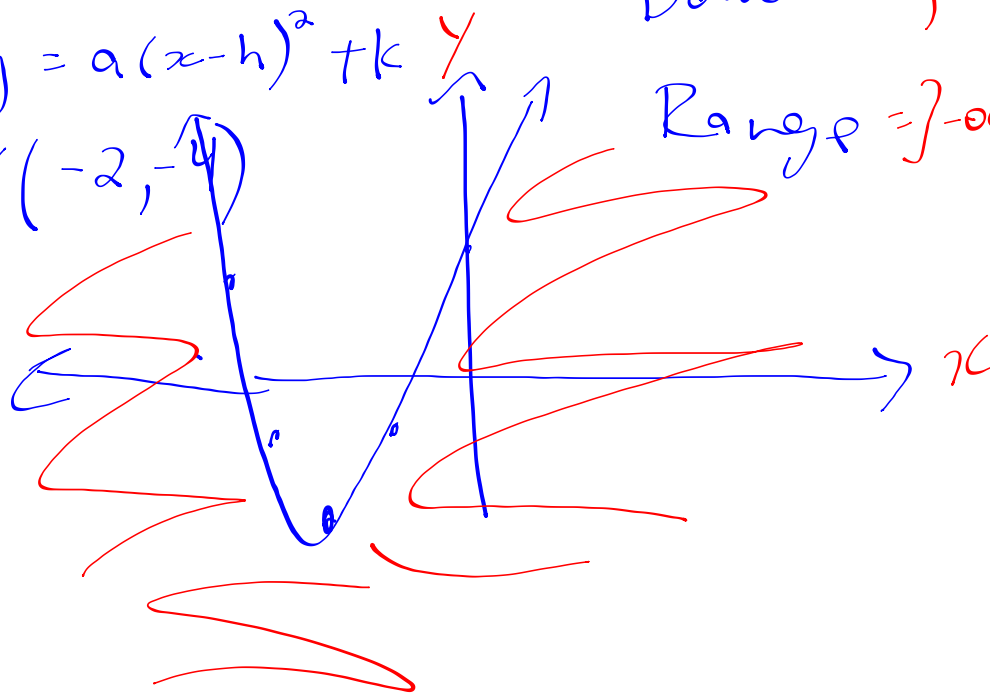
$$y \leq 2(x+2)^2 - 4$$

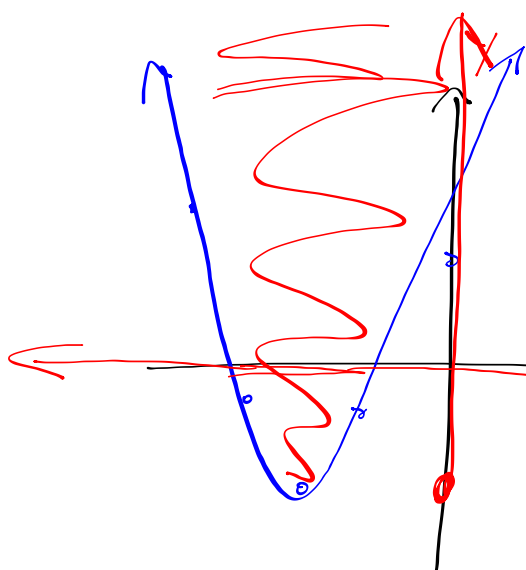
$$y = a(x-h)^2 + k$$

$$V(-2, -4)$$

$$\text{Domain} = \{-\infty, \infty\}$$

$$\text{Range} = \{-\infty, \infty\}$$





Domain = $] -\infty, \infty [$
Range = $[-4, \infty [$

Give the equation of this
inequality in set builders
notation

① First find equation
of parabola

$$y = a(x-h)^2 + k$$

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

sub in $(-1, 0)$

$$0 = a(-1-1)^2 - 4$$

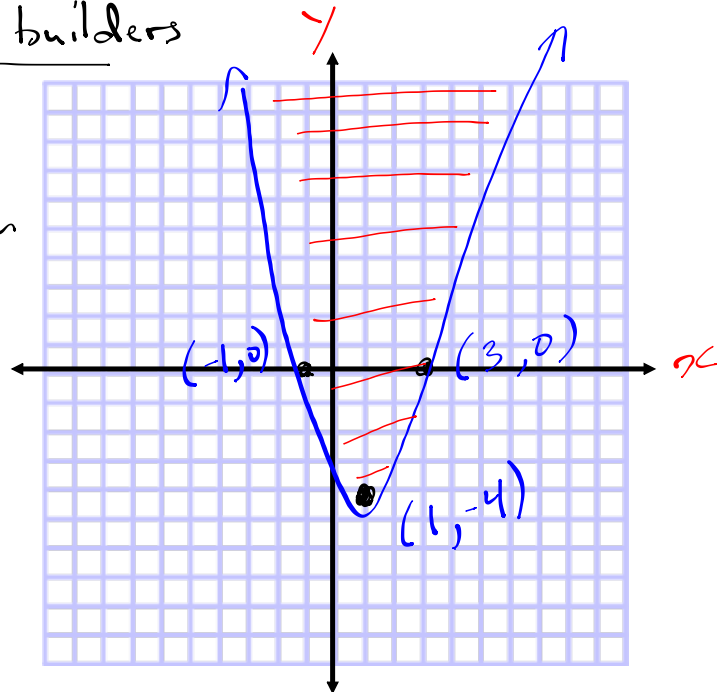
$$0 = 4a - 4$$

$$4a = 4$$

$$a = 1$$

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

$$y > 1(x-1)^2 - 4$$



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

Step ② Take a point in
shaded region ex $(4, 0)$
and make a true statement

$$y ? 1(x-1)^2 - 4$$

$$0 ? 1(1-1)^2 - 4$$

$$0 ? -4$$

$$0 > -4$$

Determine the inequality defined by

$$y = a(x - x_1)(x - x_2)$$

x-ints $(2, 0)$

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

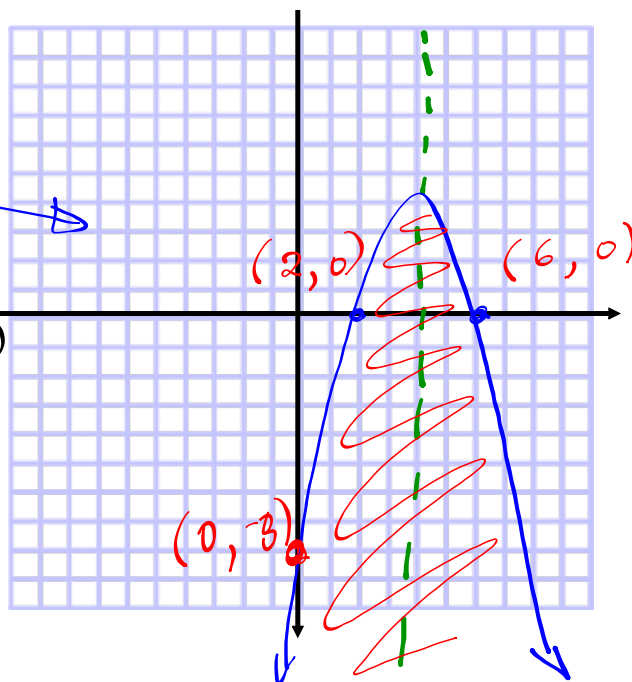
sub $(0, -8)$

$$-8 = a(0 - 2)(0 - 6)$$

$$-8 = a(-2)(-6)$$

$$\frac{-8}{12} = \frac{a(12)}{12}$$

$$a = -\frac{2}{3}$$



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

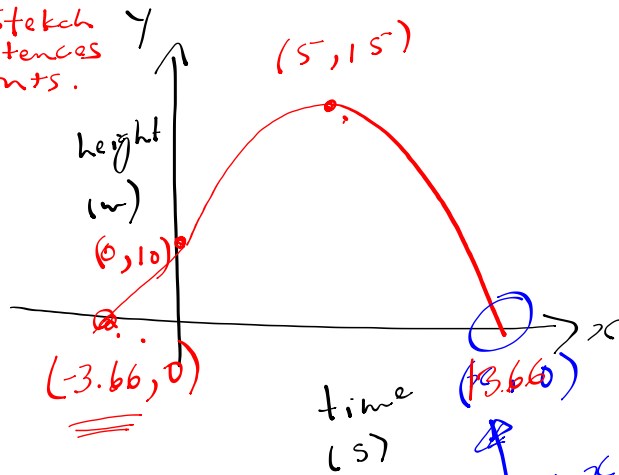
$$\sqrt{(4, y)}$$

$$y = -\frac{2}{3}(4 - 2)(4 - 6)$$

$$y = \frac{8}{3} = 2.66 \quad \sqrt{(4, 2.66)}$$

P. 11.11 # / Understand / Sketch
Translate sentences into points.

A projectile is launched from the top of a 10m high cliff. It reaches a max vertex height of 15m is 5 sec. Determine how long it took the projectile to reach the ground.



Identify the point in question.

$V(5, 15)$

$P(0, 10)$

$y = a(x - 5)^2 + 15$

$10 = a(0 - 5)^2 + 15$

$10 = a(25) + 15$

$-5 = a(25)$ $a = \frac{-1}{5}$

How to determine the x-int. find x

Determine the formula

Start w $y = a(x - h)^2 + k$

$y = \frac{-1}{5}(x - 5)^2 + 15$

Find x-int (x, 0)

$0 = \frac{-1}{5}(x - 5)^2 + 15$

don't foil just isolate

$-15 = \frac{-1}{5}(x - 5)^2$

$\sqrt{(x - 5)^2} = \sqrt{75}$

$x - 5 = \pm 8.66 + 5$

$x_1 = 8.66 + 5 = 13.66$

or

$x_2 = -8.66 + 5 = -3.66$

- B
- E
- D
- M
- A
- J

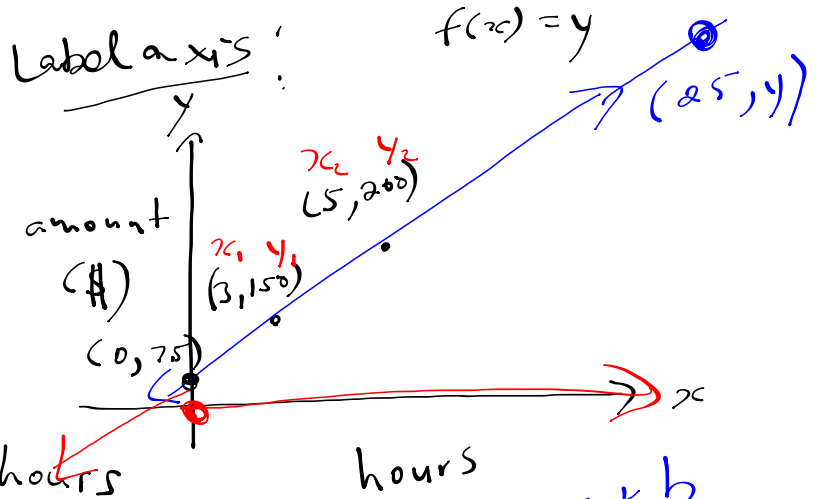
$-15 \times \frac{5}{-1}$

∴ it took 13.66 s for the ball to reach the ground

pg 11.14

#1

How much does the electrician charge for 25 hours of work.



So to y you need the equation of the line

$$y = mx + b$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{200 - 150}{5 - 3}$$

$$m = \frac{50}{2}$$

$$m = 25$$

$$m = \frac{y - y_1}{x - x_1}$$

$$25 = \frac{y - 150}{x - 3}$$

$$25(x - 3) = y - 150$$

$$25x - 75 = y - 150$$

$$y = 25x + 75$$

$$x = 25 \text{ hrs}$$

$$y = 25(25) + 75$$

$$y = 700 \$$$

Unit 12: Describing the Characteristics of Various Functions of Word Questions

p 12.9

$$2. \quad m = \frac{y_2 - y_1}{x_2 - x_1} \quad m = \frac{y - y_1}{x - x_1}$$

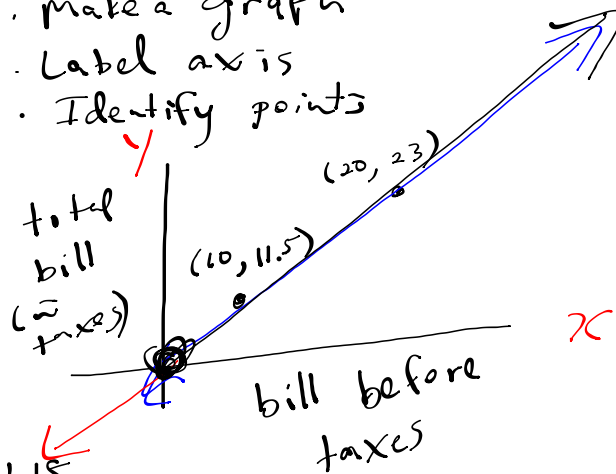
$$y = mx + b$$

$$y = 0.15(20) + 26$$

$$y = 0.15x + 26$$

$$y = 1.15x$$

- make a graph
- Label axis
- Identify points

a) linear / 1st degree

b) slope = rate of change = 1.15

c) positive

d) $[0, \infty[$ e) $(0, 0)$

g) Domain $[0, \infty[$
 Range $[0, \infty[$

f) not really

P12.19
#2

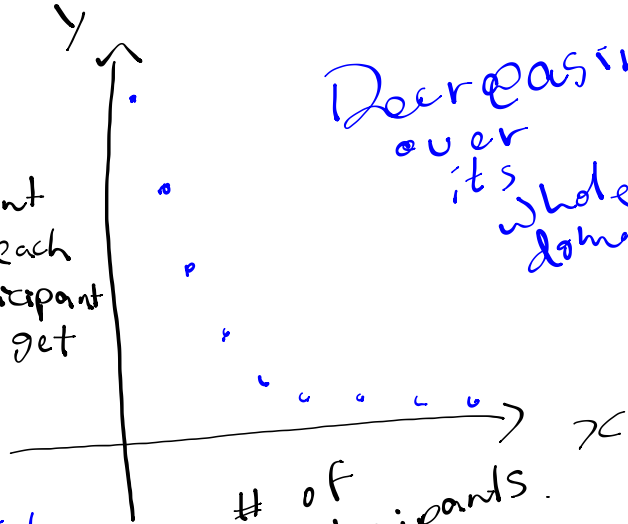
$$y = \frac{1000}{x}$$

total amount
\$ 1000

x	y
0	0
1	1000
2	500
5	200
10	100
15	
20	50

. positive

amount
\$ each
participant
will get



Decreasing
over
its
whole
domain.

\$ everyone
had to get
at least
\$ 50

Domain = {1, 2, 3... 20}
Range = {1000, 500, ... 50}

max (1, 1000)
min (20, 50)

2. A stone is tossed in the air.

If height is a function time, then

$f(x) = 4 + 10x - 5x^2$ represents the stone's

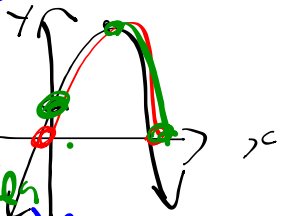
flight.

$$y = ax^2 + bx + c$$

x -ints \rightarrow use the quad formula

vertex \rightarrow vertex formula

positive and decreasing interval



a) Determine the

b) Determine the

c) Determine $f(0)$

y when $x = 0$

d) Determine the Range.