# Maths Answers

# Page 48
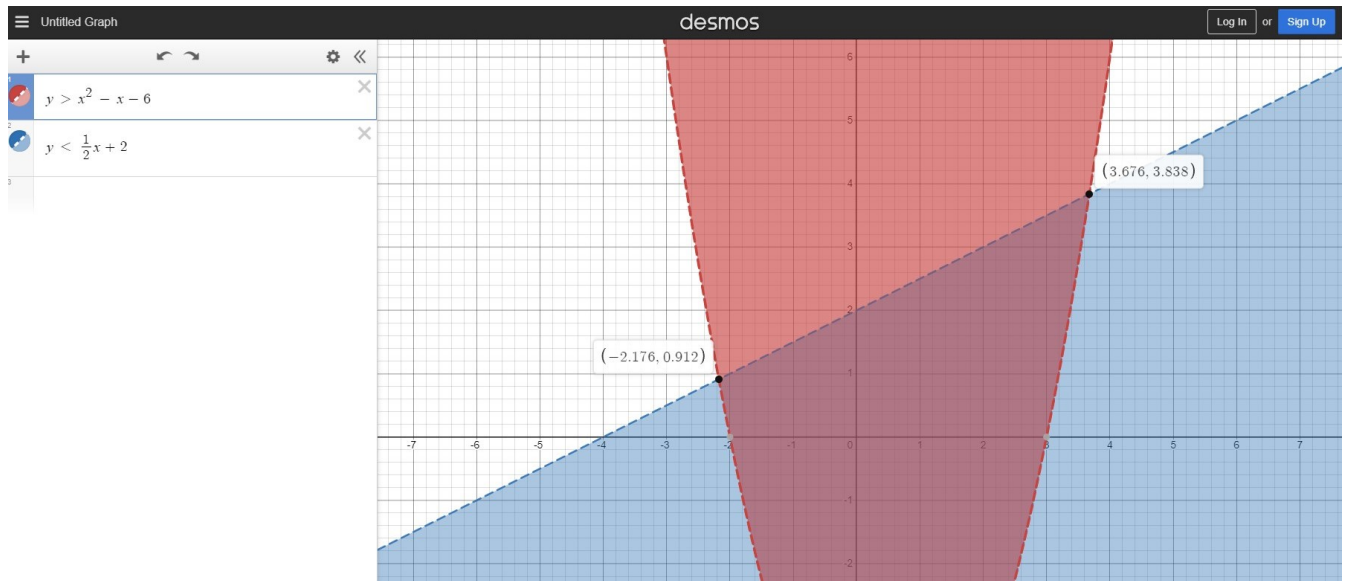
Some useful tools I used:

- Desmos: https://www.desmos.com/calculator. graphing tool
- MathPapa Algebra Calculator: https://www.mathpapa.com/algebra-calculator.html. You can put your equation in, and evaluate any value.
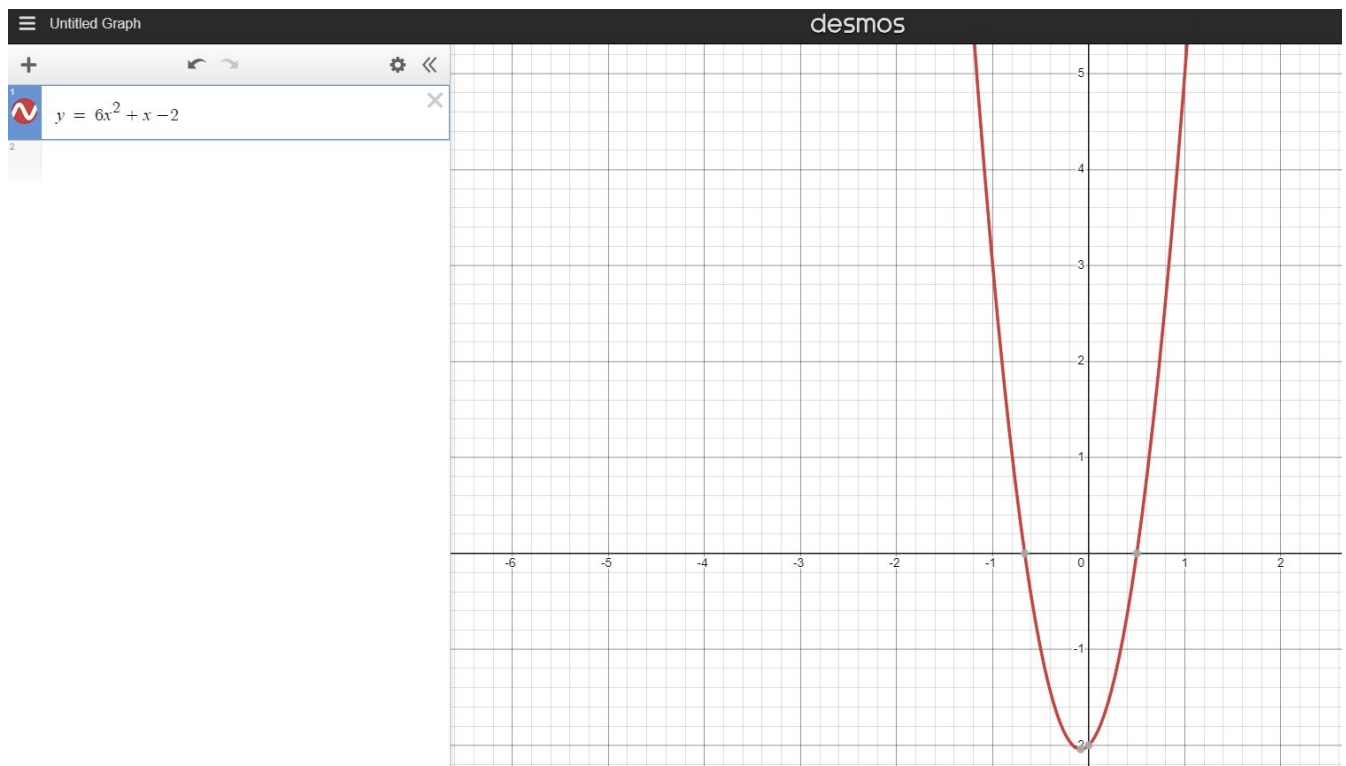
# Question 7

Plot this into your graph paper. I used an online tool called desmos.com to plot it.



# Question 8

Plot this into your graph paper.



# Question 9

General equation of a circle: $(x - a)^2 + (y - b)^2 = r^2$

We know the center is (1, -3). and the radius is 5.

Substitute the known center, and radius values, into the general equation.

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

Simplify:

$$(x-1)^2 + (y+3)^2 = 25$$

Expand the squared brackets, and simplify:

$$x^2 - x - x + 1 + y^2 + 3y + 3y + 9 = 25$$

$$x^2 - 2x + y^2 + 6y + 10 = 25$$

$$x^2 + y^2 - 2x + 6y - 15 = 0$$

# Question 10

$$x^2 + y^2 + 10x - 2y - 10 = 0$$

$$x^2 + 10x + y^2 - 2y - 10 = 0$$

$$(x - (-5))^2 + (y - 1)^2 = 6^2$$

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## Exercise 2.1

### Question 1

$$f(1) = 5^x = 5^1 = 5$$

### Question 2

Already answered in the book.

### Question 3

$$h(4) = 2(2^x) = 2(2^4) = 2(16) = 32$$

### Question 4

$$g(2) = -6(3^x) = -6(3^2) = -6(9) = -54$$

### Question 5

$$f(4) = -(2^x) = -(2^4) = -(16) = -16$$

### Question 6

$$h(2) = 2(5^x) = 2(5^2) = 2(25) = 50$$

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## Question 7

| X | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y_1 = 3^x$ | .037 | .111 | .333 | 1 | 3 | 9 | 27 |
| $y_2 = 2(3^x)$ | .074 | .222 | .666 | 2 | 6 | 18 | 54 |
| $y_3 = \frac{1}{2}(3^x)$ | .0185 | .055 | .166 | 0.5 | 1.5 | 4.5 | 13.5 |
| $y_4 = 3^x + 2$ | 2.037 | 2.111 | 2.333 | 3 | 5 | 11 | 29 |
| $y_5 = 3^x - 2$ | -1.962 | -1.88 | -1.666 | -1 | 1 | 7 | 25 |

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## Question 8

| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y_1 = \left(\frac{1}{2}\right)^x$ | 8 | 4 | 2 | 1 | 0.5 | 0.25 | 0.125 |
| $y_2 = 2\left(\frac{1}{2}\right)^x$ | 16 | 8 | 4 | 2 | 1 | 0.5 | 0.25 |
| $y_3 = \frac{1}{2}\left(\frac{1}{2}\right)^x$ | 4 | 2 | 1 | 0.5 | 0.25 | 0.125 | 0.0625 |
| $y_4 = \left(\frac{1}{2}\right)^x + 2$ | 10 | 6 | 4 | 3 | 2.5 | 2.25 | 2.125 |
| $y_5 = \left(\frac{1}{2}\right)^x - 2$ | 6 | 2 | 0 | -1 | -1.5 | -1.75 | -1.875 |

## Question 9

| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y_1 = -4^x$ | -0.015625 | -0.0625 | 0.25 | -1 | -4 | -16 | -64 |
| $y_2 = 2(4^x)$ | -0.03125 | -0.125 | -0.5 | -2 | -8 | -32 | -128 |
| $y_3 = -\frac{1}{2}(4^x)$ | -0.007813 | -0.03125 | -0.125 | -0.5 | -2 | -8 | -32 |
| $y_4 = -4^x + 2$ | 1.984375 | 1.9375 | 1.75 | 1 | -2 | -14 | -62 |
| $y_5 = -4^x - 2$ | -2.015625 | -2.0625 | -2.25 | -3 | -6 | -18 | -66 |

## Question 10

| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y_1 = 5^{-x}$ | 125 | 25 | 5 | 1 | 0.2 | 0.04 | 0.008 |
| $y_2 = 2(5^{-x})$ | 250 | 50 | 10 | 2 | 0.4 | 0.08 | 0.016 |
| $y_3 = \frac{1}{2}(5^{-x})$ | 62.5 | 12.5 | 2.5 | 0.5 | 0.1 | 0.02 | 0.004 |
| $y_4 = 5^{-x} + 2$ | 127 | 27 | 7 | 3 | 2.2 | 2.04 | 2.008 |
| $y_5 = 5^{-x} - 2$ | 123 | 23 | 3 | -1 | -1.8 | -1.96 | -1.992 |

## Question 11

| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y_1 = 2^{x+1}$ | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 |
| $y_2 = 2(2^{x+1})$ | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 |
| $y_3 = \frac{1}{2}(2^{x+1})$ | 0.125 | 0.25 | 0.5 | 1 | 2 | 4 | 8 |
| $y_4 = 2^{x+1} + 2$ | 2.25 | 2.5 | 3 | 4 | 6 | 10 | 18 |
| $y_5 = 2^{x+1} - 2$ | -1.75 | -1.5 | -1 | 0 | 2 | 6 | 14 |

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| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y_1 = 4^{x-2}$ | 0.000977 | 0.003906 | 0.015625 | 0.0625 | 0.25 | 1 | 4 |
| $y_2 = 2(4^{x-2})$ | 0.001953 | 0.007813 | 0.03125 | 0.125 | 0.5 | 2 | 8 |
| $y_3 = \frac{1}{2}(4^{x-2})$ | 0.000488 | 0.001953 | 0.007813 | 0.03125 | 0.125 | 0.5 | 2 |
| $y_4 = 4^{x-2} + 2$ | 2.000977 | 2.003906 | 2.015625 | 2.0625 | 2.25 | 3 | 6 |
| $y_5 = 4^{x-2} - 2$ | -1.999023 | -1.996094 | -1.984375 | -1.9375 | -1.75 | -1 | 2 |

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## Question 13



## Question 14

**Untitled Graph**

$2^{(x+1)}$

desmos

# Question 15

**Untitled Graph**

$\frac{1}{2}\left(2^{x}\right)$

desmos
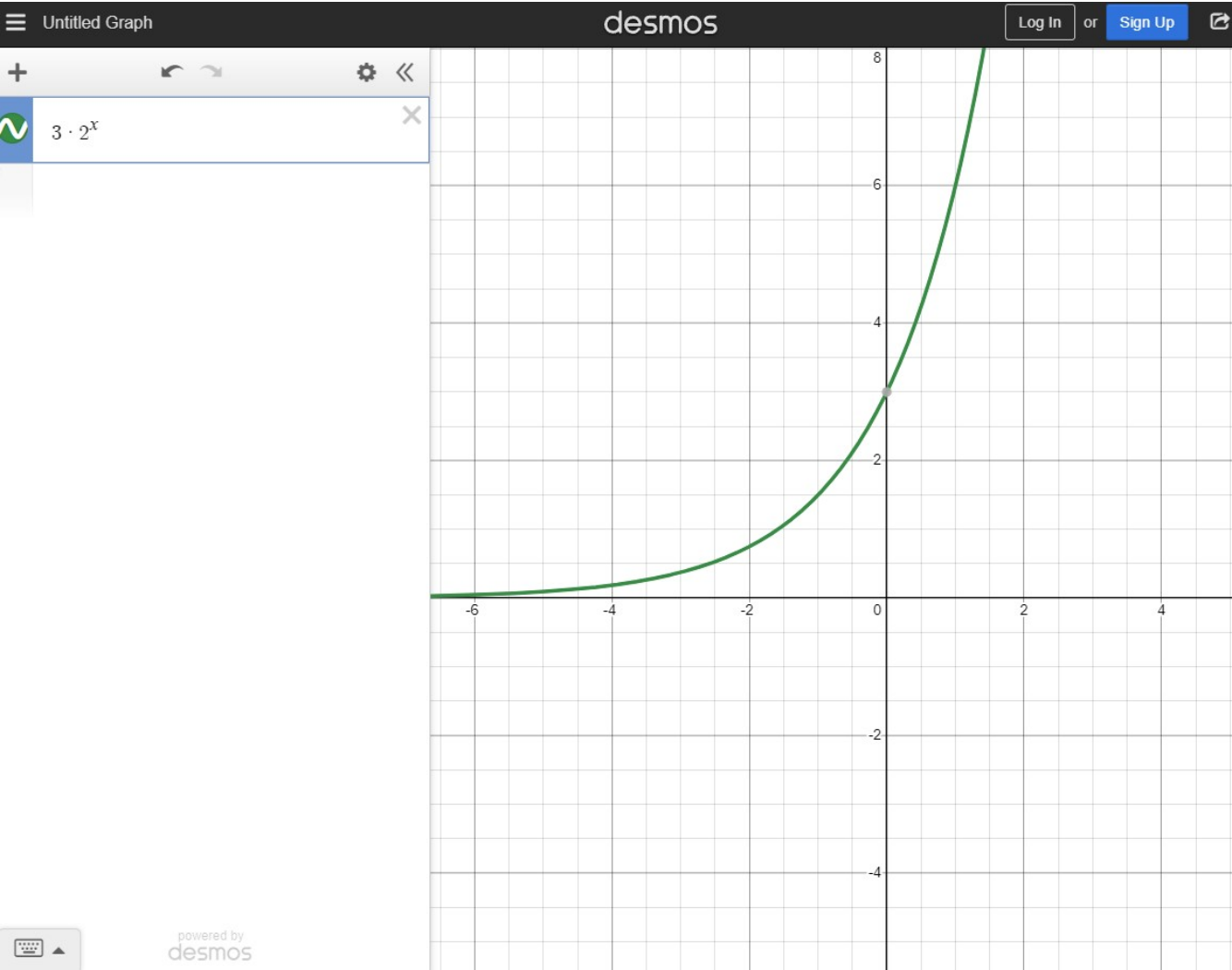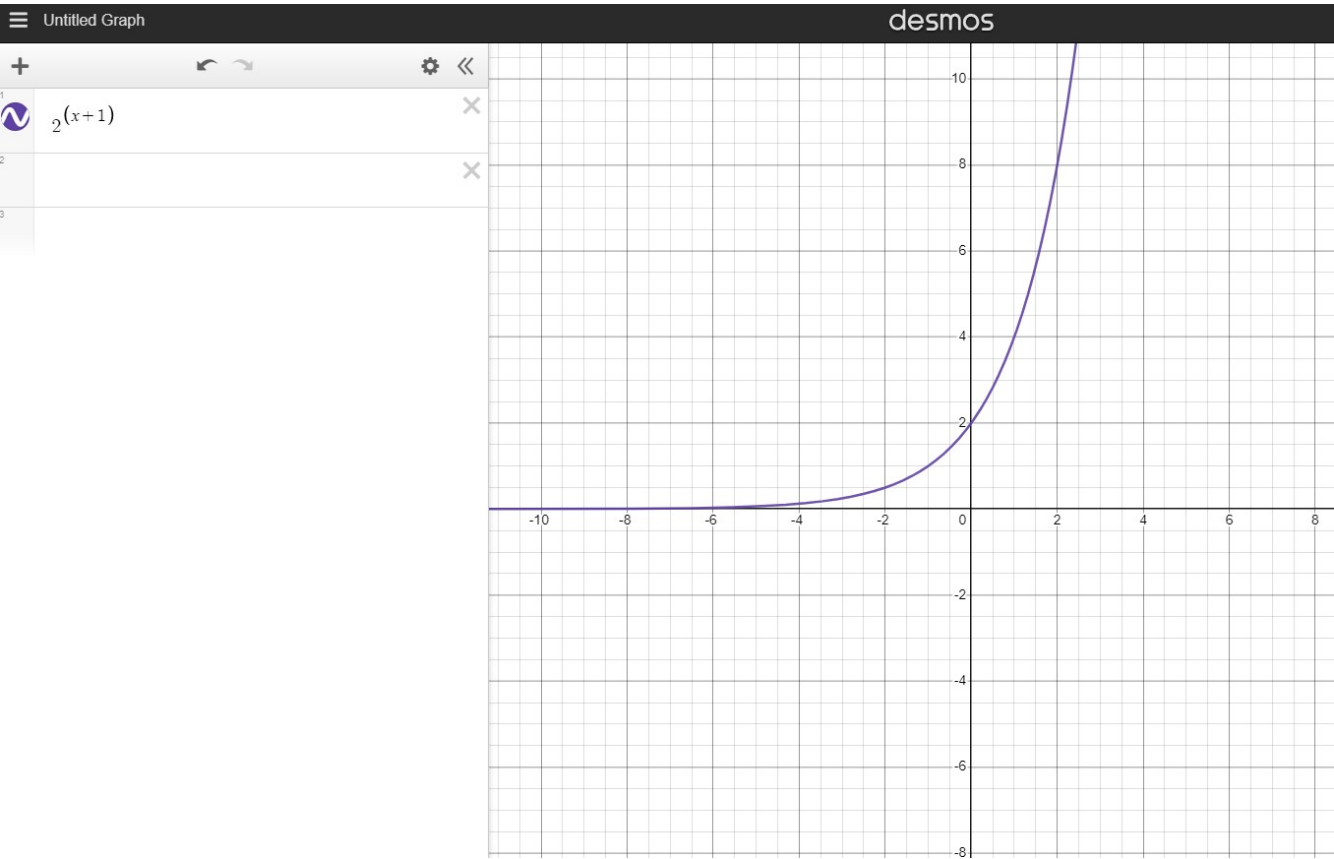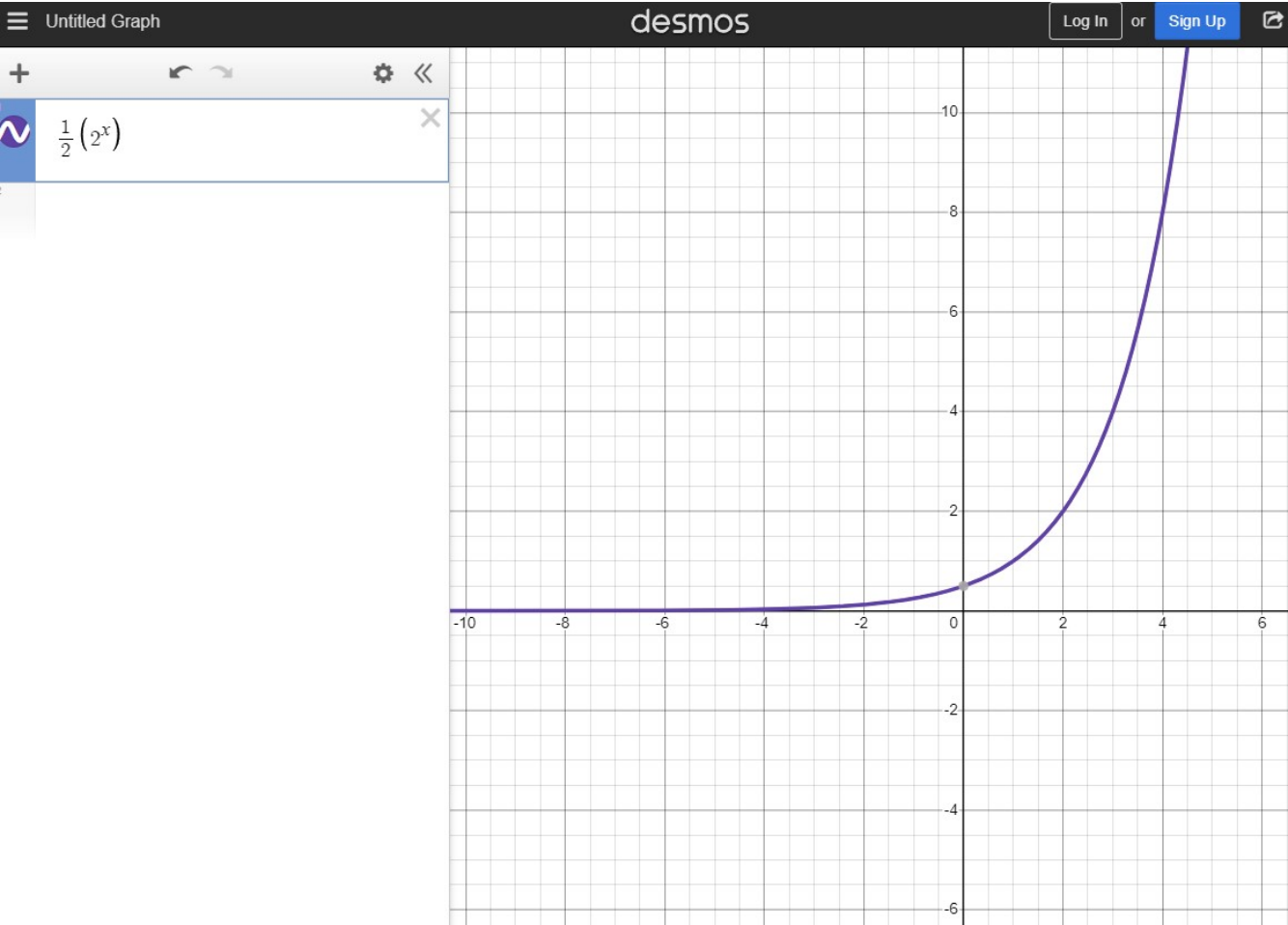
# Page 56

## Question 17

$$3^{3x+5} = 3^{x+4}$$

$$3x + 5 = x + 4$$

$$3x - x = 4 - 5$$

$$2x = -1$$

$$x = -\frac{1}{2}$$

## Question 18

$$3^{2t} = 3^{4t-6}$$

$$2t = 4t - 6$$

$$2t - 4t = -6$$

$$-2t = -6$$

$$2t = 6$$

$$t = 6/2$$

$$t = 3$$

## Question 19

$$7^{5w} = 7^{3w-10}$$

$$5w = 3w - 10$$

$$5w - 3w = -10$$

$$2w = -10$$

$$w = -10/2$$

$$w = -5$$

## Question 21

$$9^{t+6} = \frac{1}{9^{t+2}}$$

$$9^{t+6} = 9^{-1(t+2)}$$

$$t + 6 = -1(t + 2)$$

$$t + 6 = -t - 2$$

$$t + t = -2 - 6$$

$$2t = -8$$

$$t = -8/2$$

$$t = -4$$

# Question 22

There is a mistake in the book here. The example from the book is:

$$2^x \cdot 2^3 = 2^5$$

$$2^{3x} = 2^5$$

$$3x = 5$$

$$x = \frac{5}{3}$$

The second line is wrong, it should be:

$$2^{3+x} = 2^5$$

Then...

$$3 + x = 5$$

$$x = 5 - 3$$

$$x = 2$$

The correct answer is $2$, not $\frac{5}{3}$

# Question 23

$$5^{2y} \cdot 5^4 = 5^6$$

$$5^{2y+4} = 5^6$$

$$2y + 4 = 6$$

$$2y = 6 - 4$$

$$2y = 2$$

$$y = 2/2$$

$$y = 1$$

# Question 24

$$3^{5c} \cdot 5^{5c} = 15^{9c-4}$$

$$15^{5c} = 15^{9c-4}$$

$$5c = 9c - 4$$

$$5c - 9c = -4$$

$$-4c = -4$$

$$4c = 4$$

$$c = 4/4$$

$$c = 1$$

# Question 25

$$2^{2p} \cdot 7^{2p} = 14^{6p-2}$$

$$14^{2p} = 14^{6p-2}$$

$$2p = 6p - 2$$

$$2p - 6p = -2$$

$$-4p = -2$$

$$4p = 2$$

$$p = 2/4$$

$$p = 1/2$$

$$p = 0.5$$

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## Question 26

There is also a mistake here.

$$9^{x+3} > 9^1$$

The example in the book is that

$$x + 3 > 0$$

This is wrong because it is $9^1$ so it should be:

$$x + 3 > 1$$

$$x > 1 - 3$$

$$x > -2$$

## Question 27

$$5^x \leq 5^4$$

$$x \leq 4$$

## Question 28

$$2^{2m-2} \geq 2^{5m+6}$$

$$2m - 2 \geq 5m + 6$$

$$2m - 5m \geq 6 + 2$$

$$-3m \geq 8$$

$$m \geq -\frac{8}{3}$$

## Question 29

$$7^{2y-3} < 7^{5y+6}$$

$$2y - 3 < 5y + 6$$

$$2y - 5y < 6 + 3$$

$$-3y < 9$$

$$y < -\frac{9}{3}$$

$$y < -3$$

# Question 30

I think this question is wrong.

$$\left(\frac{1}{3}\right)^{w+4} \geq \left(\frac{1}{3}\right)^{w-5}$$

Sign changes as the coefficient $a$ is less than 1

$$w + 4 \leq w - 5$$

$$w \leq w - 5 - 4$$

$$w \leq w - 9$$

There is no solution for the inequality above, becacuse $w - 9$ is strictly smaller than $w$. This question is wrong.

# Question 31

$$\left(\frac{1}{6}\right)^{t+2} \geq \left(\frac{1}{6}\right)^{5t-4}$$

Sign changes as the coefficient $a$ is less than 1.

$$t + 2 \leq 5t - 4$$

$$t - 5t \leq -4 - 2$$

$$-4t \leq -6$$

$$4t \leq 6$$

$$t \leq \frac{6}{4}$$

$$t \leq \frac{3}{2}$$

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I only plotted the graph for all these questions, to fill the table you can just use your calculator.
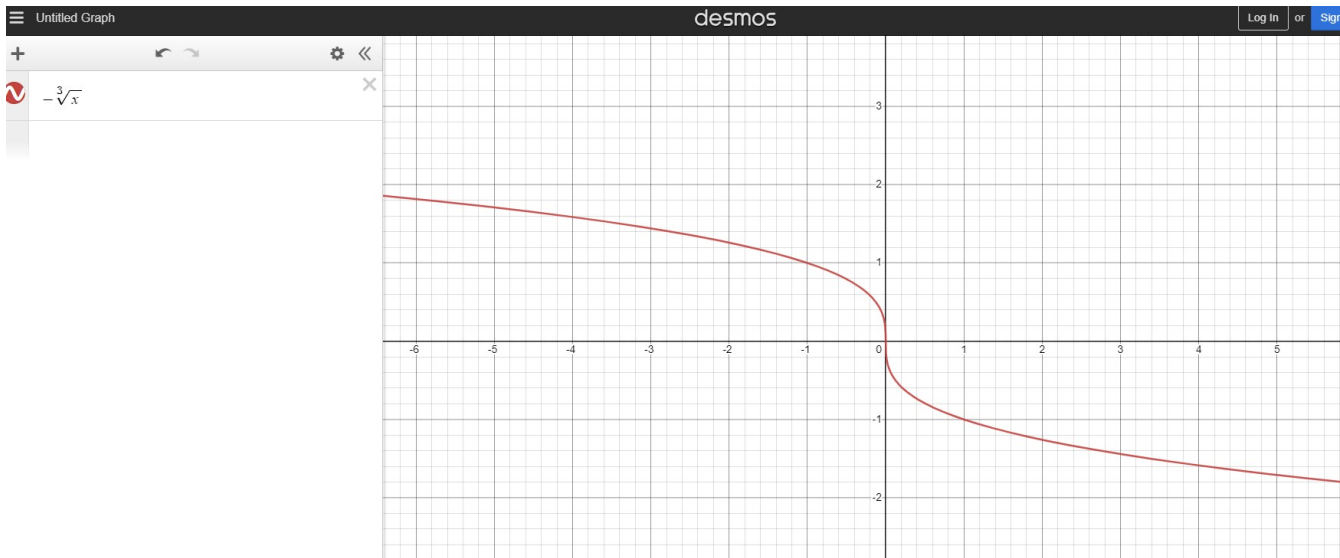
## Question 1
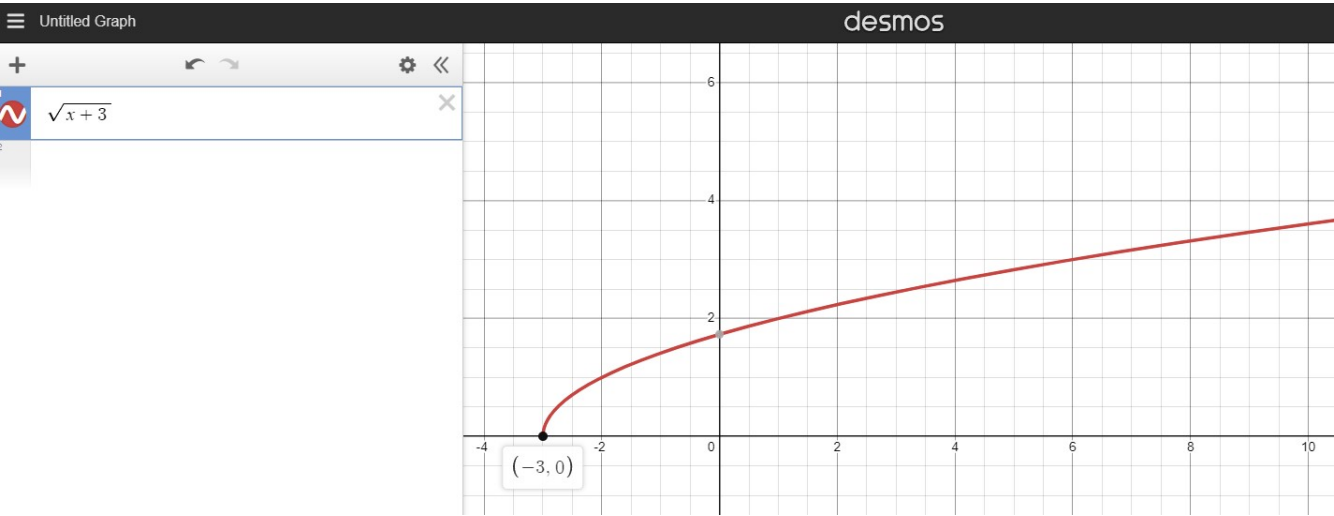


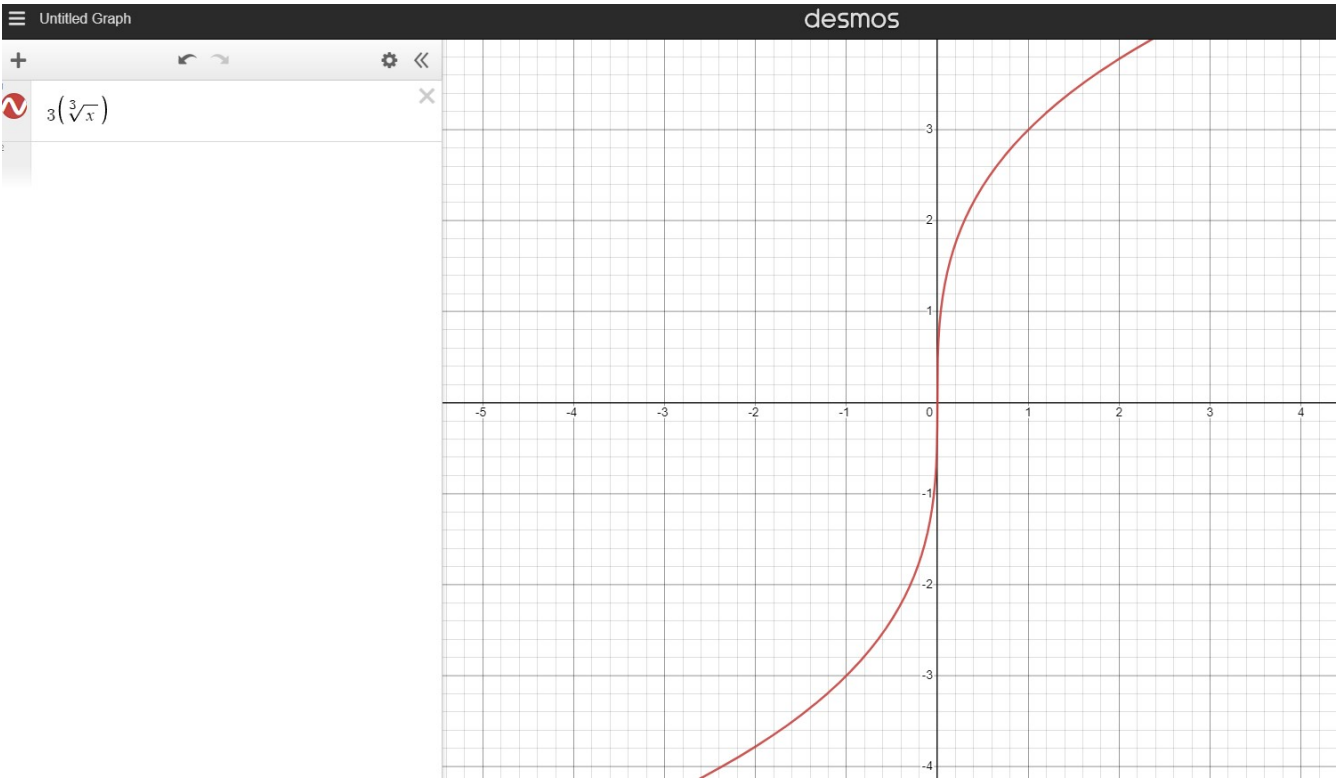## Question 2
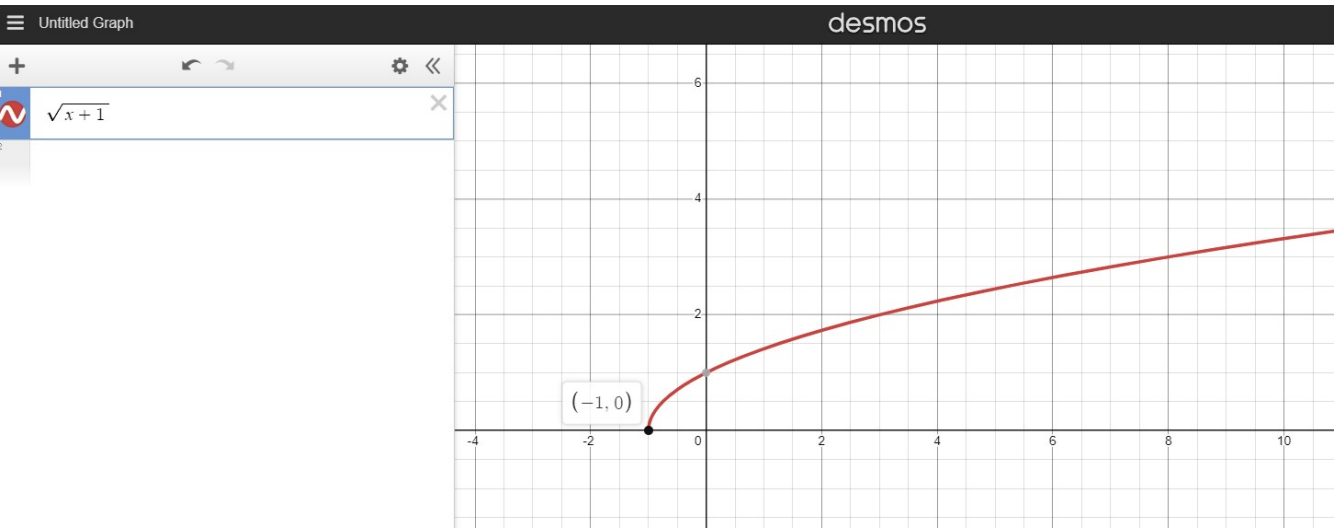


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## Question 3
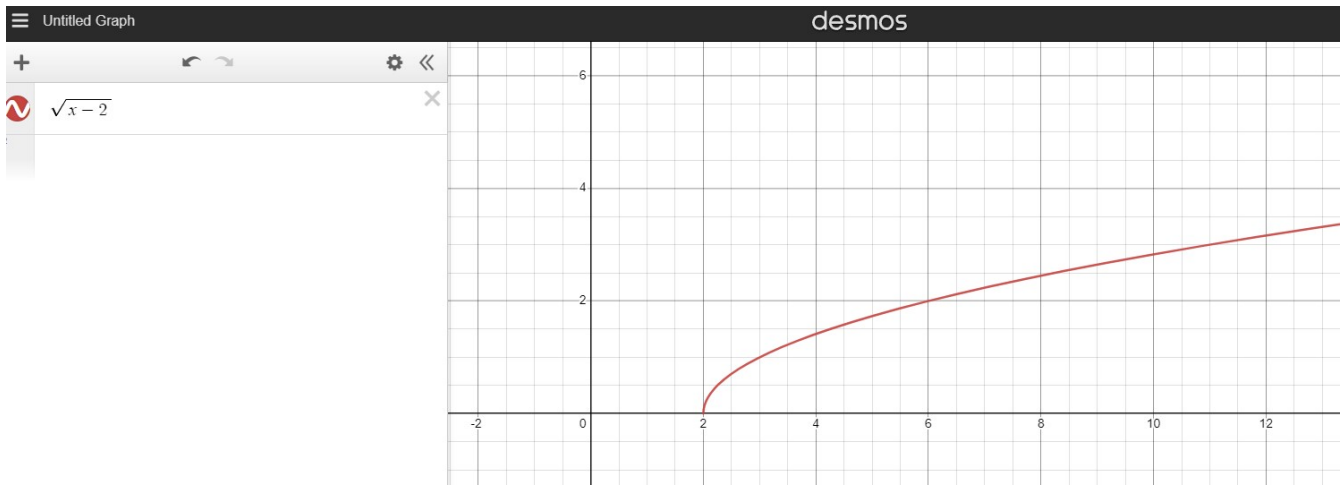
$\sqrt{x-2}$

# Page 61

## Question 4



$-\sqrt[3]{x}$

## Question 5

$$3\left(\sqrt[3]{x}\right)$$

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## Question 6



$$\frac{1}{3}\left(\sqrt[3]{x}\right)$$

## Question 7

$$3\left(\sqrt[3]{x}\right)$$

$$\left(\sqrt[3]{x+1}\right)$$

# Question 8



$$\left(\sqrt[3]{x-3}\right)$$

$(3, 0)$

# Question 9



$$\left(\sqrt[3]{x-2}\right)$$

$(2, 0)$
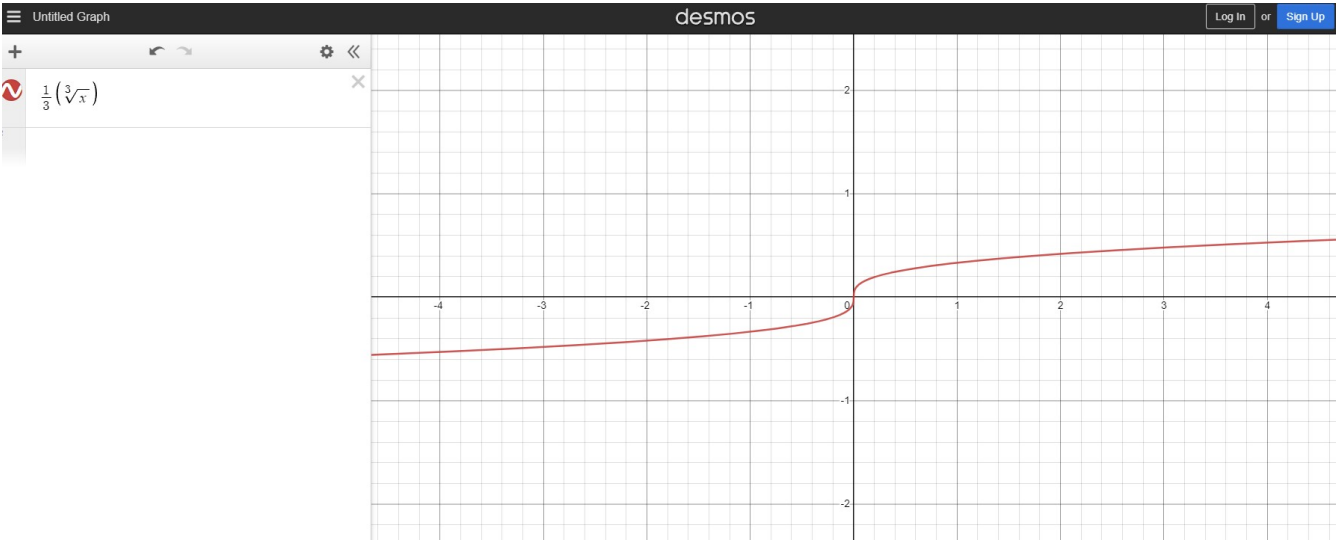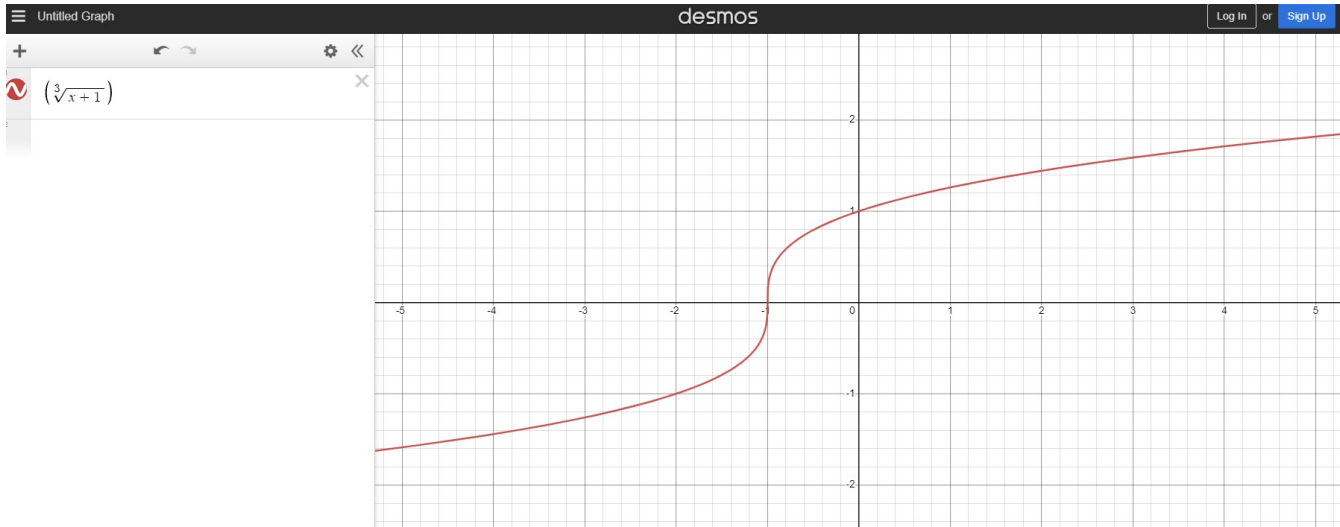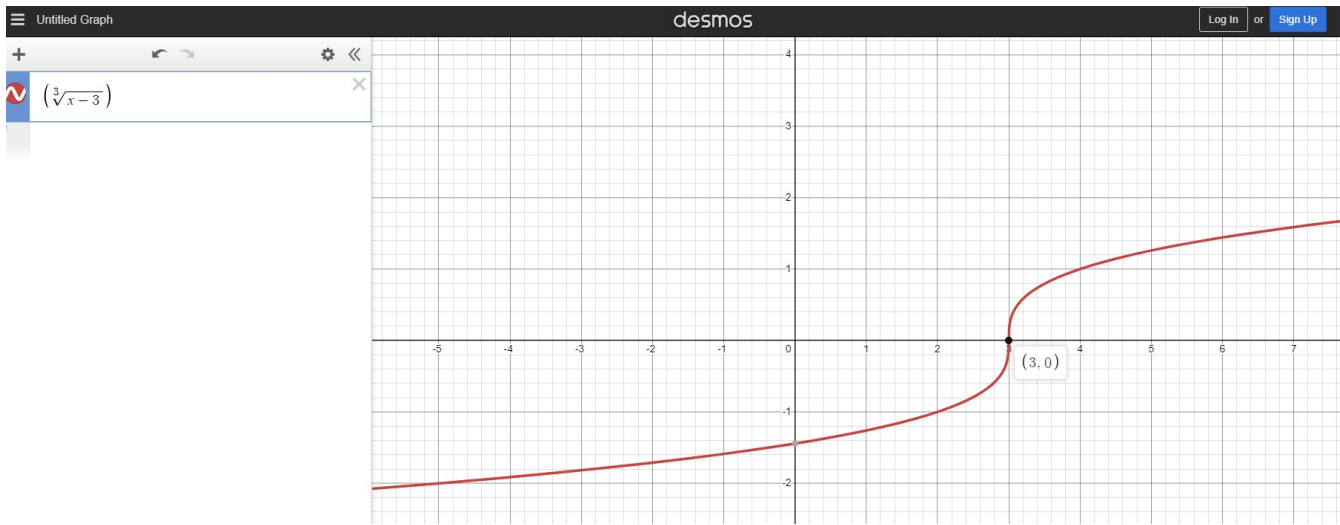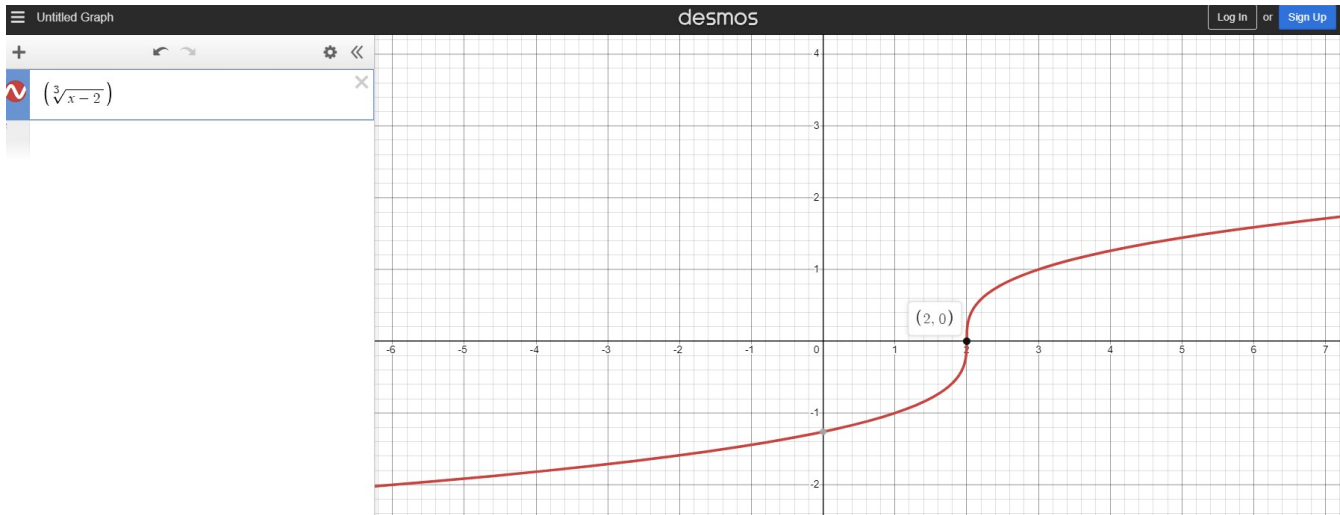
# Page 63

## Question 10



# Page 64

## Question 11

**Untitled Graph**          desmos

$y = \{x > 1 : 4x - 1\}$

$y = \{x \le 1 : -2\}$

## Question 12

**Untitled Graph**          desmos

$y = \{x \ge 0 : x - 3\}$

$y = \{x < 0 : 1\}$
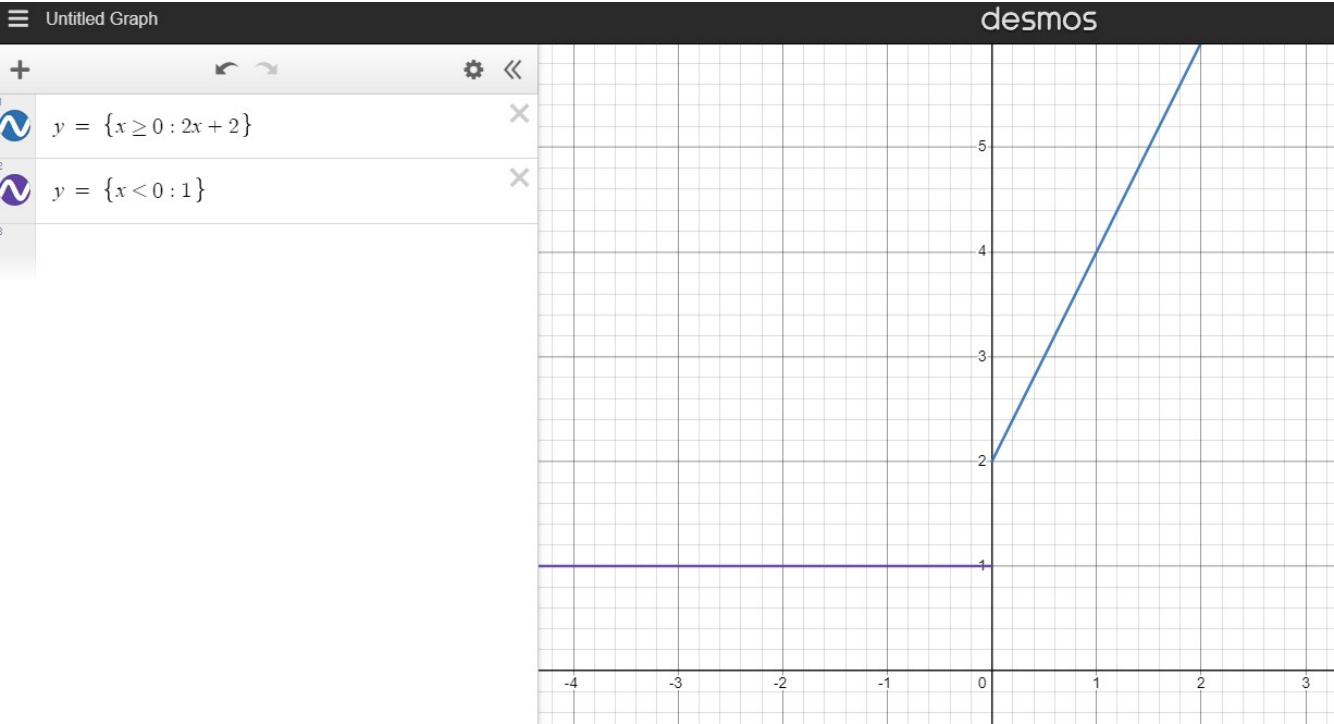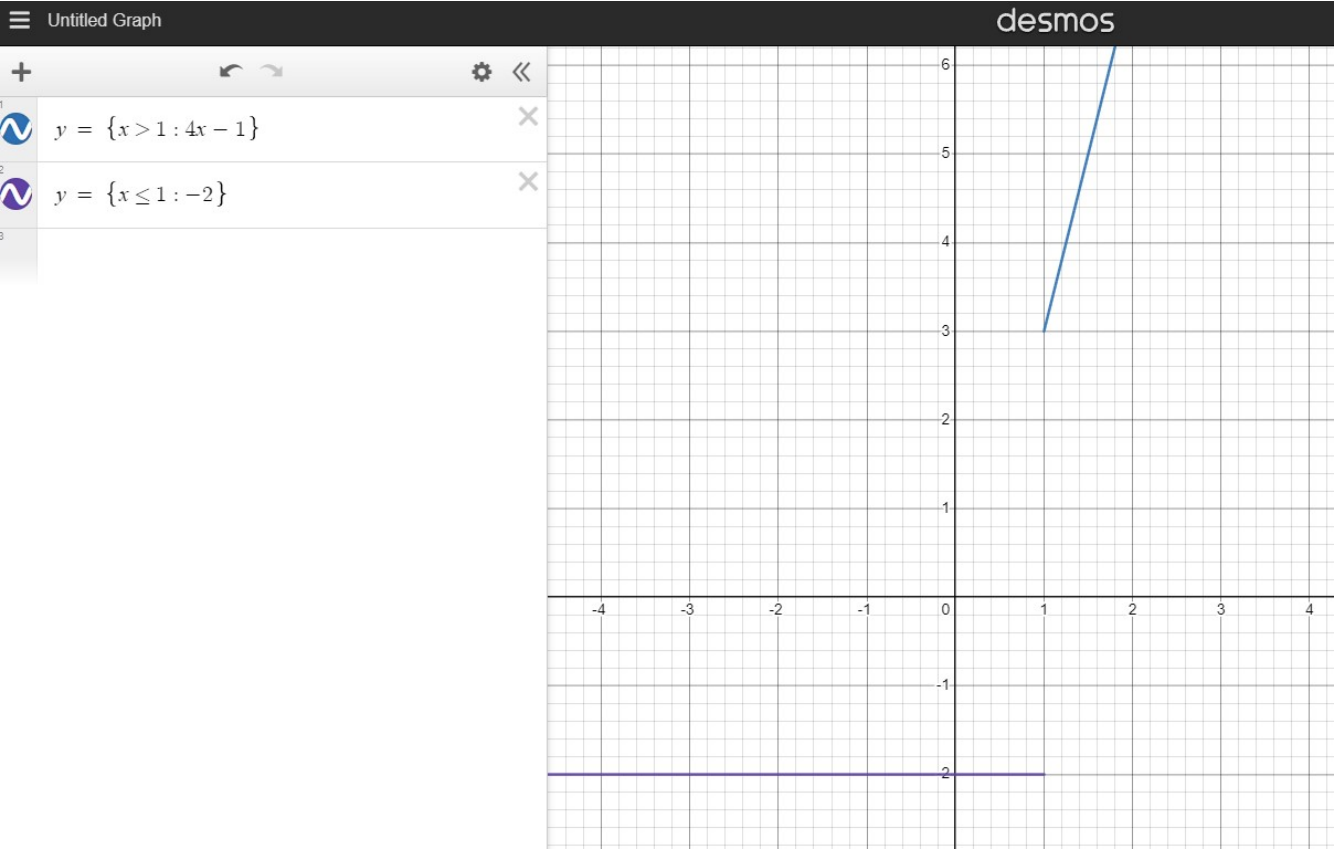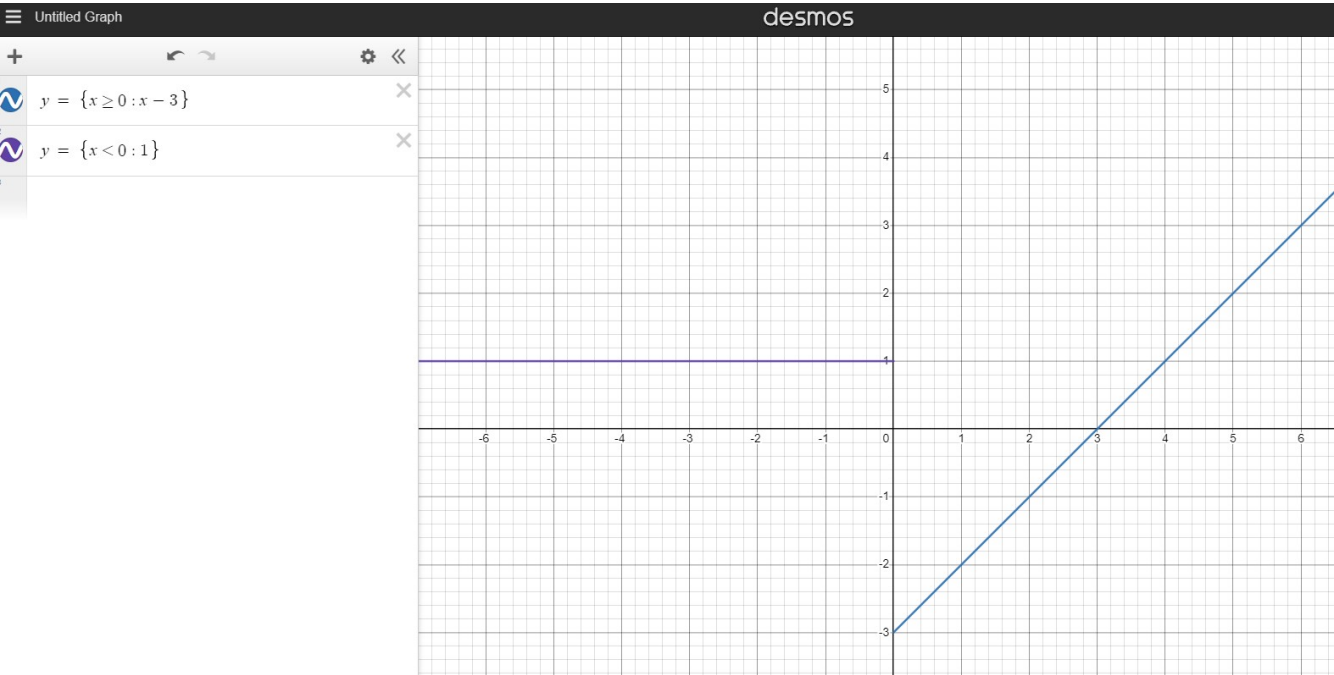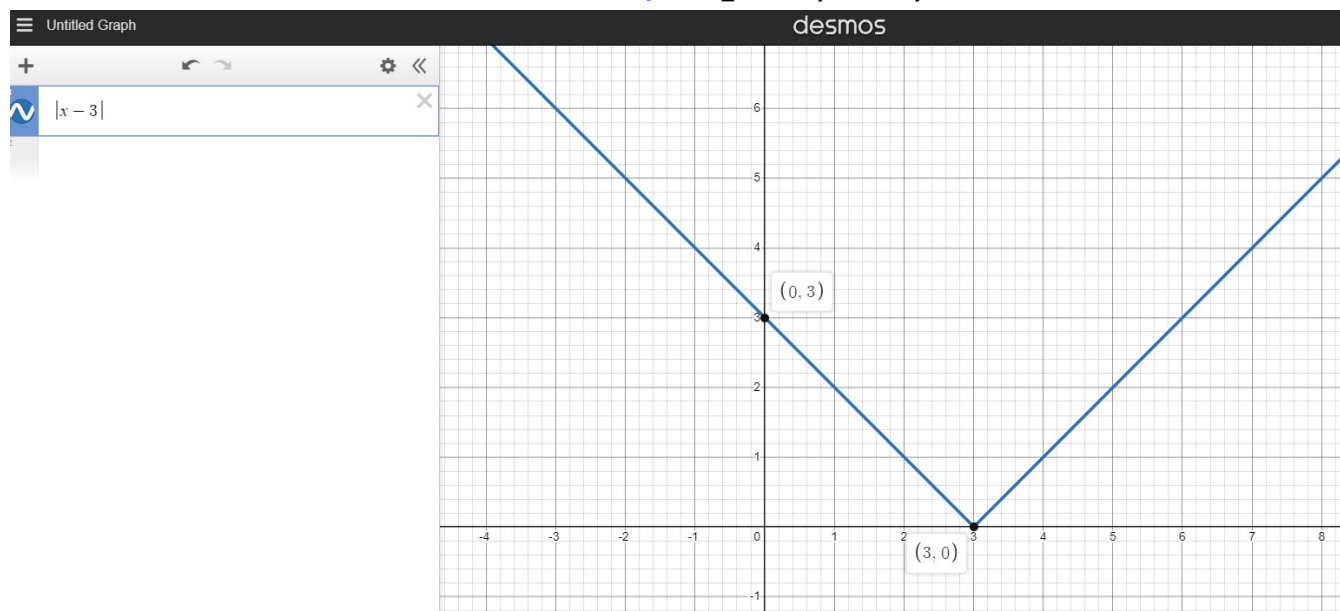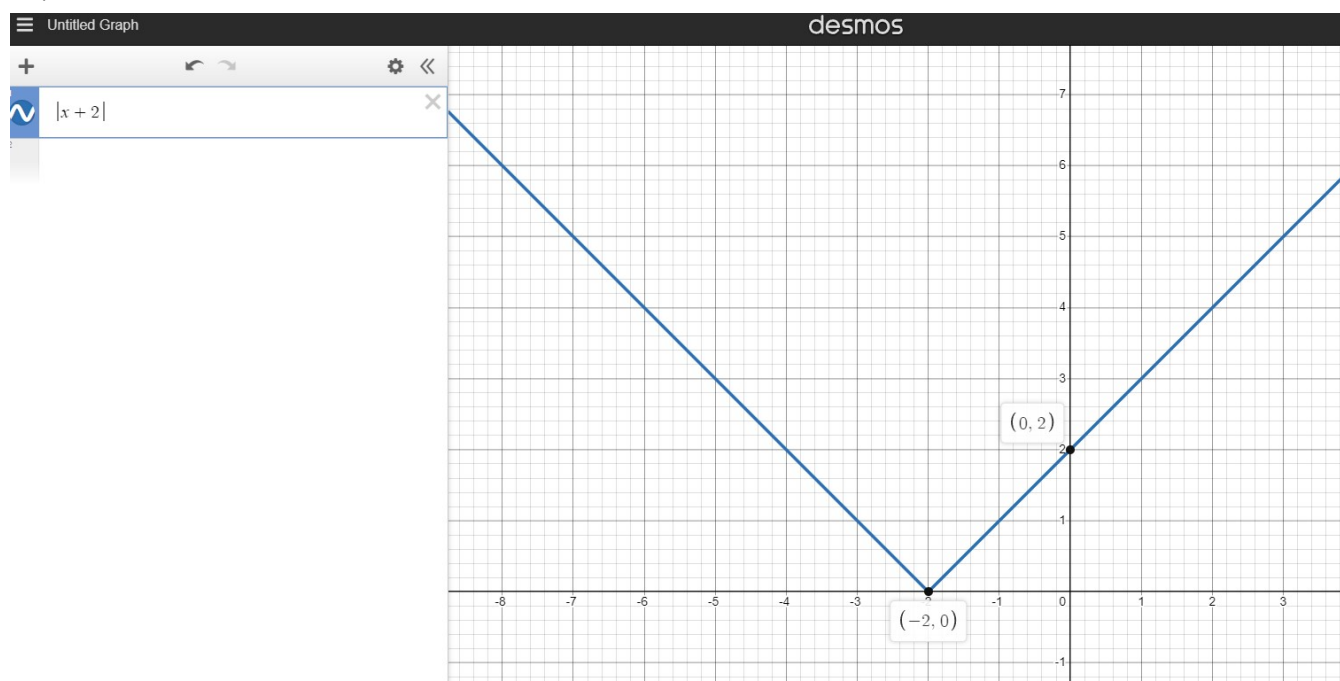
# Page 66

Piecewise functions, the intersect and reflection points are marked on the graph. If you need to fill in the tables in your workbook, just plug in the x values into your calculator, should be easy.
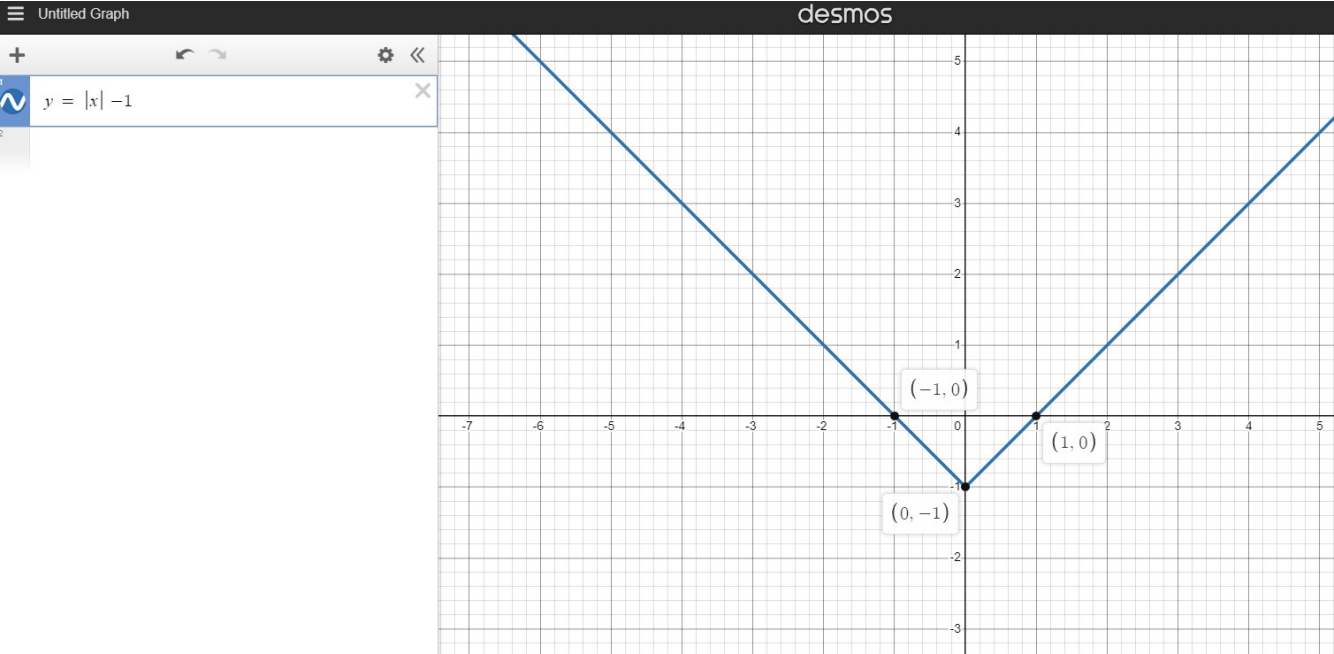
## Question 13

# Question 14



# Question 15

Untitled Graph

desmos

$y = |x| - 1$



$(-1, 0)$

$(1, 0)$

$(0, -1)$

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## Exercise 2.3

## Question 2

$$(f - g)(x) = (5x + 2) - (x - 6)$$

$$= 5x - x + 2 - 6$$

$$= 4x - 4$$

If $x = -2$, then...

$$(f - g)(-2) = 4(-2) - 4$$

$$= -8 - 4$$

$$= -12$$

## Question 3

$$(sr)(m) = m \cdot (m + 5)$$

$$= m^2 + 5m$$

If $m = -4$, then...

$$(sr)(-4) = (-4)^2 + 5(-4)$$

$$= 16 + (-20)$$

$$= -4$$

## Question 4

$$\left(\frac{q}{p}\right)(t) = \frac{t + 1}{t - 1}$$

$$\left(\frac{q}{p}\right)(7) = \frac{7 + 1}{7 - 1}$$

$$= \frac{8}{6}$$

$$= \frac{4}{3}$$

# Question 5

$$(g+f)(a) = a + (-2a - 1)$$

$$= -a - 1$$

$$(g+f)(-3) = -(-3) - 1$$

$$= 3 - 1$$

$$= 2$$

# Question 6

$$(h-g)(n) = (3n + 1) - (-5n - 6)$$

$$= 3n + 1 + 5n + 6$$

$$= 8n + 7$$

$$(h-g)(2) = 8(2) + 7$$

$$= 16 + 7$$

$$= 23$$

# Question 7

$$(sr)(n) = (n+1) \cdot (2n+1)$$

$$(sr)(-1) = (-1+1) \cdot (2(-1)+1)$$

$$= (0) \cdot (-1)$$

$$= 0$$

# Question 8

$$\left(\frac{q}{p}\right)(b) = \frac{b-8}{b-4}$$

$$\left(\frac{q}{p}\right)(-3) = \frac{-3-8}{-3-4}$$

$$= \frac{-11}{-7}$$

$$= \frac{11}{7}$$

# Question 9

$$(f + g)(x) = (x + 7) + (x + 1)$$

$$(f + g)(-2) = (-2 + 7) + (-2 + 1)$$

$$= 5 + (-1)$$

$$= 4$$

# Question 10

$$(h - g)(t) = (3t + 5) - 2t$$

$$= t + 5$$

$$(h - g)(4) = 4 + 5$$

$$= 9$$

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## Question 11

$$(rs)(w) = (-3w - 1) \cdot (w - 5)$$

$$(rs)(-3) = (-3(-3) - 1) \cdot (-3 - 5)$$

$$= (9 - 1) \cdot (-8)$$

$$= 8 \times -8$$

$$= -64$$

## Question 12

$$\left(\frac{p}{q}\right)(r) = \frac{r - 12}{2r + 6}$$

$$\left(\frac{p}{q}\right)(2) = \frac{2 - 12}{2(2) + 6}$$

$$= \frac{-10}{10}$$

$$= -1$$

## Question 13

$$(f \circ g)(x) = (x - 1) + 2$$

$$(f \circ g)(-2) = (-2 - 1) + 2$$

$$= -3 + 2$$

$$= -1$$

$$(g \circ f)(x) = (x + 2) - 1$$

$$(g \circ f)(3) = (3 + 2) - 1$$

$$= 4$$

# Question 14

$$(g \circ h)(w) = (w - 3) - 1$$

$$(g \circ h)(3) = (3 - 3) - 1$$

$$= (0) - 1$$

$$= 0$$

$$(h \circ g)(w) = (w - 1) - 3$$

$$(h \circ g)(-2) = (-2 - 1) - 3$$

$$= -3 - 3$$

$$= -6$$

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Example page.

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## Question 15

$$f(x) = x - 2$$

$$y = x - 2$$

$$y + 2 = x$$

$$x + 2 = y$$

$$f^{-1}(x) = x + 2$$

.

$$g(x) = x + 4$$

$$y = x + 4$$

$$y - 4 = x$$

$$x - 4 = y$$

$$g^{-1}(x) = x - 4$$

.

$$(f \circ g)^{-1}(x) = (x - 4) + 2$$

$$= x - 2$$

.

$$(g^{-1} \circ f^{-1})(x) = (x + 2) - 4$$

$$= x - 2$$

# Question 16

$$f(x) = 2x - 3$$

$$y = 2x - 3$$

$$y + 3 = 2x$$

$$\frac{y + 3}{2} = x$$

$$\frac{x + 3}{2} = y$$

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

.

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

$$y = x + 2$$

$$y - 2 = x$$

$$x - 2 = y$$

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

.

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

$$f^{-1}(1) = \frac{1 + 3}{2}$$

$$= \frac{4}{2}$$

$$= 2$$

.

$$f^{-1}(2) = \frac{2 + 3}{2}$$

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

$$= 2.5$$

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## Chapter 2 Test

### Question 1

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

$$= 2^{-1}$$

$$= \frac{1}{2^1}$$

$$= \frac{1}{2}$$

### Question 2

$$g(3) = 5^x$$

$$= 5^3$$

$$= 125$$

### Question 3

$$h(3) = (3^x)$$

$$= 3^3$$

$$= 27$$

### Question 4

$$y = 2^x$$

| x | y |
| --- | --- |
| -2 | 0.25 |
| -1 | 0.5 |
| 0 | 1 |
| 1 | 2 |
| 2 | 4 |
| 3 | 8 |
| 4 | 16 |

☰   Untitled Graph

$2^x$

(0, 1)
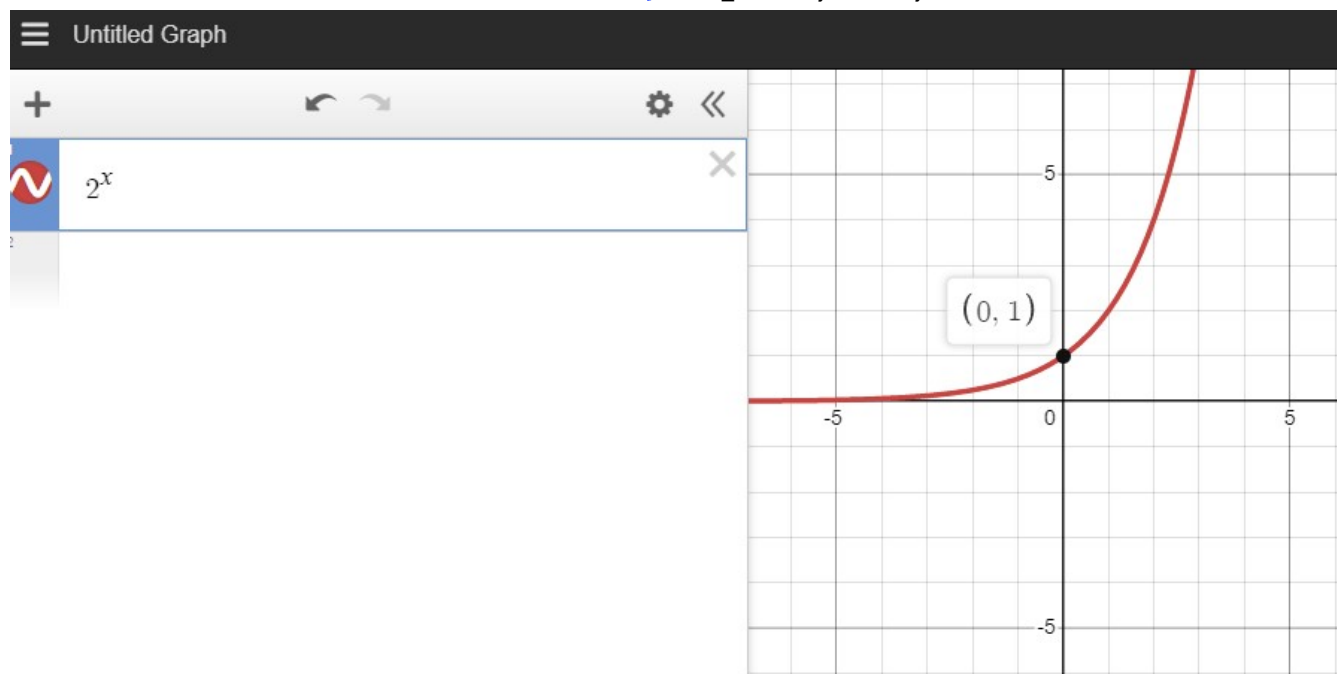
# Question 5

$$y = 2^{-x}$$

| x | y |
|---|---|
| −1 | 2 |
| 0 | 1 |
| 1 | 0.5 |
| 2 | 0.25 |
| 3 | 0.125 |
| 4 | 0.0625 |
| 5 | 0.03125 |

☰   Untitled Graph

$2^{-x}$

(0, 1)
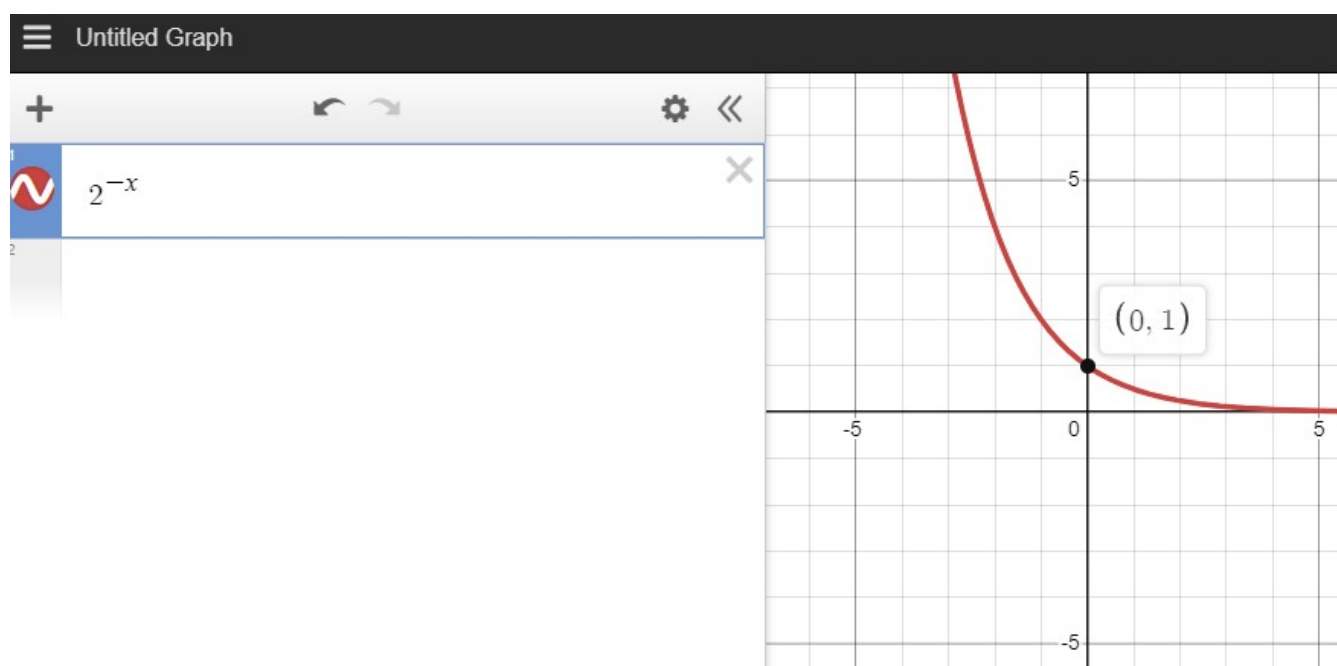
# Question 6

$$2^{2x} = 2^{3x-7}$$

$$2x = 3x - 7$$

$$2x - 3x = -7$$

$$-x = -7$$

$$x = 7$$

# Question 7

$$3^{6n} = 3^{n+5}$$

$$6n = n + 5$$

$$6n - n = 5$$

$$5n = 5$$

$$n = 1$$

# Question 8

$$\frac{1}{4^{m-2}} = 4^{2m-5}$$

$$4^{-(m-2)} = 4^{2m-5}$$

$$4^{-m+2)} = 4^{2m-5}$$

$$-m + 2 = 2m - 5$$

$$-m - 2m = -5 - 2$$

$$-3m = -7$$

$$m = \frac{-7}{-3}$$

$$m = \frac{7}{3}$$

# Question 9

$$5^x \cdot 5^3 = 5^{-2}$$

$$x + 3 = -2$$

$$x = -2 - 3$$

$$x = -5$$

# Question 10

$$3^{-2x} \cdot 5^{-2x} = 15^{x-6}$$

$$15^{-2x} = 15^{x-6}$$

$$-2x = x - 6$$

$$-2x - x = -6$$

$$-3x = -6$$

$$3x = 6$$

$$x = \frac{6}{3}$$

$$x = 2$$

# Question 11

$$3^x < 3^2$$

$$x < 2$$

# Question 12

$$5^{2x-6} \geq 5^{x-10}$$

$$2x - 6 \geq x - 10$$

$$2x - x \geq -10 + 6$$

$$x \geq -4$$

# Question 13

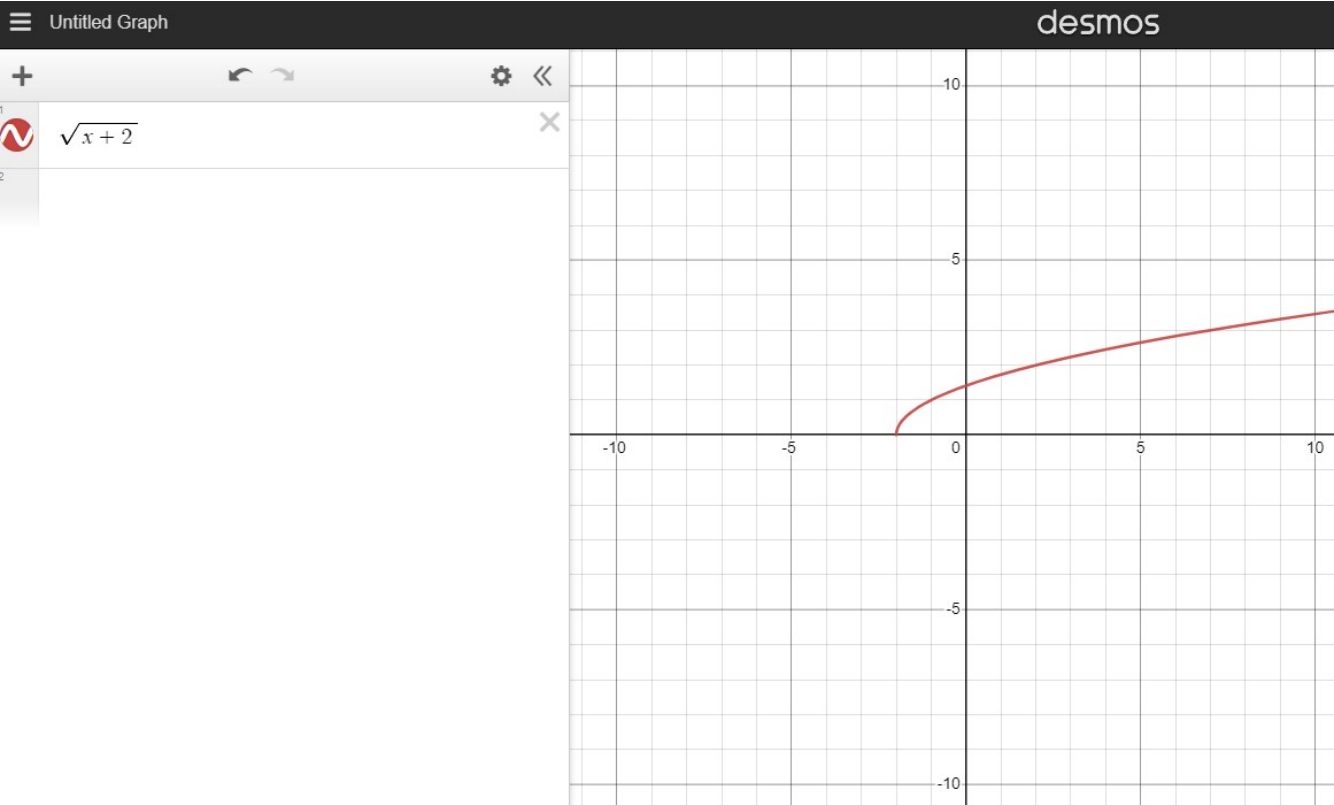$$(1)^{x+1} < (1)^{2x+3}$$

$$x + 1 < 2x + 3$$

$$1 - 3 < 2x - x$$

$$-2 < x$$

$$x > -2$$

# Question 14

$$f(x) = \sqrt{x + 2}$$

| x | y |
|---:|---:|
| −2 | 0 |
| −1 | 1 |
| 0 | 1.414214 |
| 1 | 1.732051 |
| 2 | 2 |

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## Question 15

This question is exactly the same as the previous, question 14.

## Functions for the next questions

$$f(x) = x - 1$$

$$g(x) = x + 5$$

## Question 16

$$(f + g)(x) = (x - 1) + (x + 5)$$

$$(f + g)(1) = (1 - 1) + (1 + 5)$$

$$= (0) + (6)$$

$$= 6$$

## Question 17

$$(f - g)(x) = (x - 1) - (x + 5)$$

$$(f - g)(-2) = (-2 - 1) - (-2 + 5)$$

$$= (-3) - (3)$$

$$= -6$$

## Question 18

$$(fg)(x) = (x - 1) \cdot (x + 5)$$

$$(fg)(-1) = (-1 - 1) \cdot (-1 + 5)$$

$$(fg)(-1) = (-2) \cdot (4)$$

$$= -8$$

## Question 19

$$\frac{g}{f}(x) = \frac{x+5}{x-1}$$

$$\frac{g}{f}(3) = \frac{3+5}{3-1}$$

$$= \frac{8}{2}$$

$$= 4$$

# Functions for the next questions

$$f(x) = x + 2$$

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

## Question 20

$$(f \circ g)(x) = (2x - 1) + 2$$

$$(f \circ g)(2) = (2(2) - 1) + 2$$

$$= 4 - 1 + 2$$

$$= 5$$

## Question 21

$$(g \circ f)(x) = 2(x + 2) - 1$$

$$(g \circ f)(-1) = 2((-1) + 2) - 1$$

$$= 2(1) - 1$$

$$= 1$$

## Question 22

$$r(x) = x - 2$$

$$y = x - 2$$

$$y + 2 = x$$

$$x + 2 = y$$

$$r^{-1}(x) = x + 2$$

.

$$s(x) = x + 4$$

$$y = x + 4$$

$$y - 4 = x$$

$$x - 4 = y$$

$$s^{-1}(x) = x - 4$$

.

$$s^{-1}(2) = 2 - 4$$

$$= -2$$

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Just explanations

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## Question 1

Given

$$x + 2(x - 3) = 24$$

Distributive

$$x + 2x - 6 = 24$$

Simplify

$$3x - 6 = 24$$

Addition

$$3x - 6 + 6 = 24 + 6$$

$$3x = 30$$

Division

$$3x \div 3 = 30 \div 3$$

$$x = 10$$

# Question 2

Given

$$\frac{1}{4}x + 3 = 2$$

Subtraction

$$\frac{1}{4}x + 3 - 3 = 2 - 3$$

$$\frac{1}{4}x = -1$$

Multiplication

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

$$x = -4$$

# Question 3

Given

$$x - 5 = 3(x + 2) + 1$$

Distributive

$$x - 5 = 3x + 6 + 1$$

Simplify

$$x - 5 = 3x + 7$$

Subtraction

$$x - x - 5 = 3x - x + 7$$

$$-5 = 2x + 7$$

Subtraction

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

$$-12 = 2x$$

Division

$$-12 \div 2 = 2x \div 2$$

$$-6 = x$$

$$x = -6$$

# Question 4

Given

$$8x - 6 = 2(x + 2)$$

Distributive

$$8x - 6 = 2x + 4$$

Subtraction

$$8x - 2x - 6 = 2x - 2x + 4$$

$$6x - 6 = 4$$

Addition

$$6x - 6 + 6 = 4 + 6$$

$$6x = 10$$

Division

$$6x \div 6 = 10 \div 6$$

$$x = \frac{10}{6}$$

Simplify

$$x = \frac{5}{3}$$

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## Question 5

Given

$$x + x = \frac{5}{6}$$

Simplify

$$2x = \frac{5}{6}$$

Division

$$2x \div 2 = \frac{5}{6} \div 2$$

$$x = \frac{5}{12}$$

## Question 6

Given

$$2x - 1 = x + 3$$

Subtraction

$$2x - x - 1 = x - x + 3$$

$$x - 1 = 3$$

Addition

$$x - 1 + 1 = 3 + 1$$

$$x = 4$$

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## Question 7

Already answered in the book.

## Question 8

1. Given
2. Distributive property
3. Subtraction property
4. Subtraction property
5. Division property

## Question 9

1. Given
2. Distributive property
3. Addition property
4. Division property

## Question 10

It is given that $3x - 6 = 5x + 2$. By subtraction property, subtract $3x$ from both sides, resulting in $-6 = 2x + 2$. By the subtraction property, subtract $2$ from both sides, resulting in $-8 = 2x$. By the division property, divide both sides by $2$. The final result is $x = -4$.
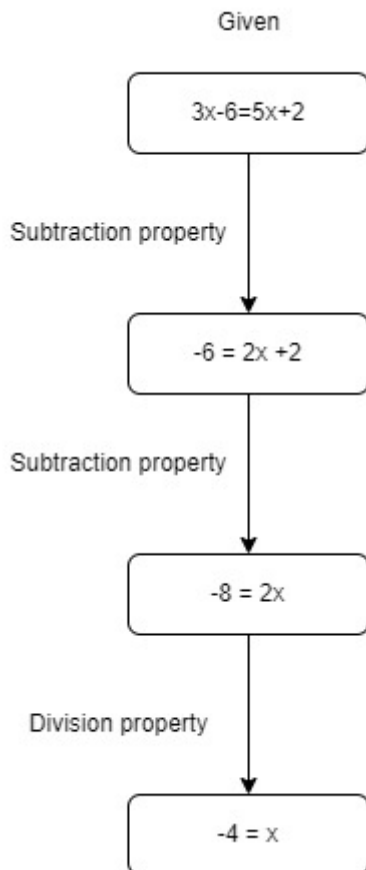
## Question 11

It is given that $2(x - 1) = 3(2x + 2)$. By distributive property, on the left hand side, multiply in the $2$, and on the right hands side multiply in the $3$. Resulting in: $2x - 2 = 6x + 6$. By the subtraction property, subtract $2x$ from both sides, resulting in: $-2 = 4x + 6$. Again by the subtraction property, subtract $6$ from both sides, resulting in $-8 = 4x$. Finally by the divison property, divide both sides by $4$, resulting in: $x = -2$.
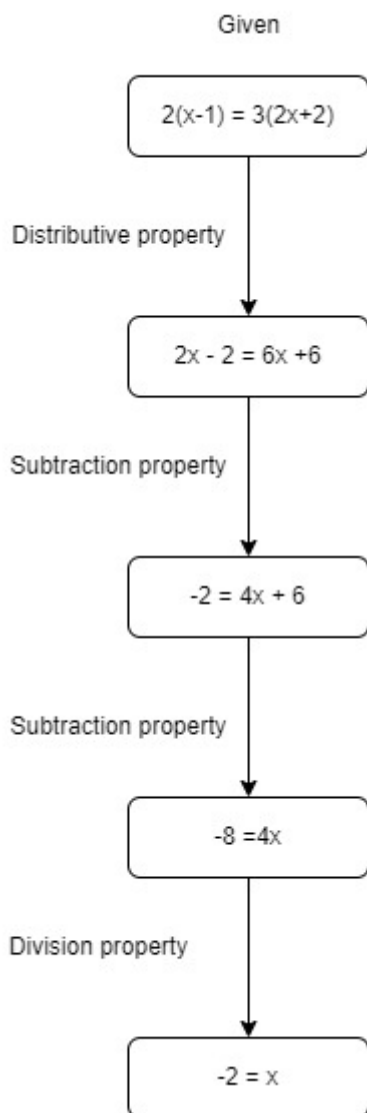
## Question 12

It is given that $2(x - 4) = 6$. By the distributive property, multiply in $2$, on the left hand side, resulting in $2x - 8 = 6$. By the addition property, add $8$ on both sides, resulting in $2x = 14$. Finally by the divison property, divide both sides by $2$, resulting in: $x = 7$.

# Question 13

Given

$$3x-6=5x+2$$

Subtraction property

$$-6 = 2x +2$$

Subtraction property

$$-8 = 2x$$

Division property

$$-4 = x$$

# Question 14

Given

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

Distributive property

$$2x - 2 = 6x + 6$$

Subtraction property

$$-2 = 4x + 6$$

Subtraction property

$$-8 = 4x$$

Division property

$$-2 = x$$

# Question 15

Given

$$2(x-4) = 6$$

Distributive property

$$2x - 8 = 6$$

Addition property

$$2x = 14$$

Division property

$$x = 7$$
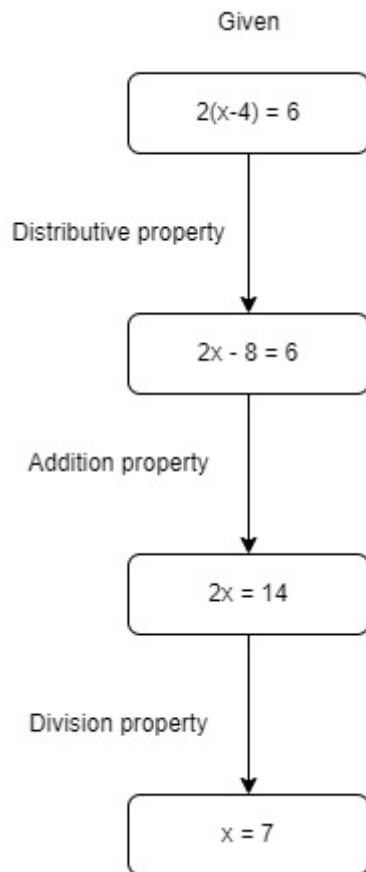
# Chapter 1 Test

## Question 3

The question states the area is 360, but the example shows $A = 90$, which I think is a typo. So if we use 360, the answer is as follows:

$$360 = (4x + 4) \cdot 3x$$

$$360 = 12x^2 + 12x$$

Divide everything by 12.

$$30 = x^2 + x$$

Complete the square.

$$x^2 + x - 30 = 0$$

$$(x - 5)(x + 6) = 0$$

For the above equation to be $= 0$, then $x$ must either be $5$, or $-6$.

Check the discriminant:

$$b^2 - 4ac$$

$$1^2 - 4(1)(-30)$$

$$1 + 120$$

$$121$$

The discriminant is positive, meaning there are two solutions. As shown above, the solutions are $x = 5$, and $x = -6$.

> **Note**
>
> If the result of the discriminant equation $a^2 - 4ac$ is positive, then there are two solutions. If it is negative, then there are no solutions, if it is exactly $0$ then there is exactly one solution.