USUAL FUNCTIONS REVIEW

I – Reminders on Functions:

A **function** is an action applied to variable.
Example: The function *f* that "doubles" could be written: $f(x) = 2x$

x is the independent variable. It can be replaced by a number or stay random.

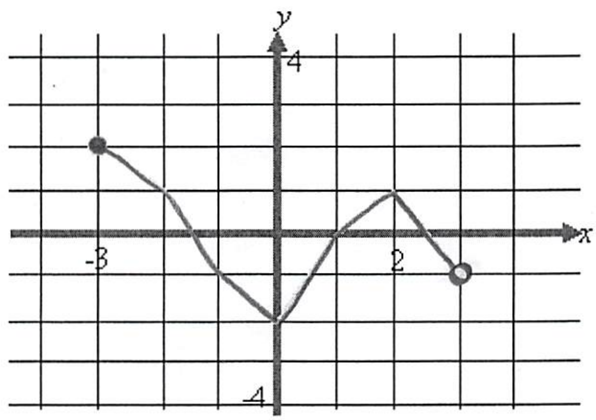
y is the result: It's *f*(*x*).

The **domain** of a function is the set of all the possible values that the independent variable (*x*) can take. We can determine the domain by looking at the expression or at the graph.
For now, we have only had restrictions on the domain when there is a denominator (it can't be 0), when there is a square root (the radicand can't be negative) or when it's a "real-life" situation (sometimes a variable has to be a whole number for example) …

The **range** of a function is the set of all the possible values that the dependent variable (*y*) can take on the domain. We can usually determine the range when we look at the graph but not really by looking at the expression.

The ***x*-intercepts** are the values of *x* for which the graph crosses the *x*-axis. We can determine them by replacing *y* by 0 in the equation.

The ***y*-intercepts** are the values of *y* for which the graph crosses the *y*-axis. We can determine them by replacing *x* by 0 in the equation.



$D = [-3; 3)$

$R = [-2; 2]$

x-intercepts: -1.5 ?
1
2.5 ?

y-intercept: -2

II – Usual Functions:

1) **Linear functions:** The graphs will be straight lines

slope-intercept form

$$y = mx + b$$

slope, y-int

ex: $y = -\frac{2}{3}x + 3$

general form

integers

$$ax + by + c = 0$$

a ⊕

ex: $3x + 5y - 7 = 0$

slope-point form

coordinates of a point on the line

$$y - y_P = m(x - x_P)$$

slope

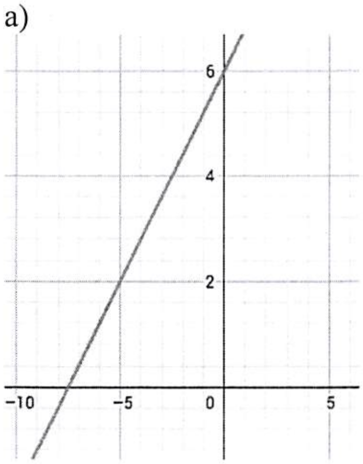
ex: $y - 5 = \frac{2}{3}(x+1)$

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

Examples:

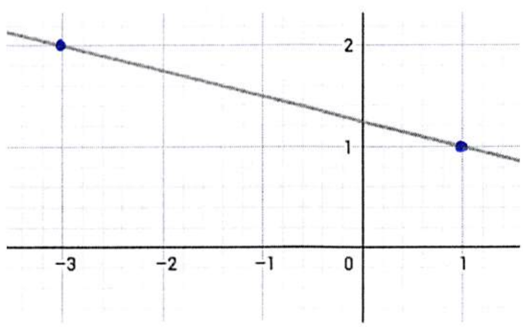
i) Determine the equations for the following linear situations:

a)



$$\boxed{y = \frac{4}{5}x + 6}$$

b)



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

c) You add to your bank account the same amount each week.

On the 6th week, your balance is \$350. On the 11th week, your balance is \$450.

(6; 350)

(11; 450)

$\Rightarrow m = \frac{100}{5} = 20$

$$\boxed{y - 350 = 20(x - 6)}$$

ii) Is the point (3;5) on the line: $y = \frac{2}{3}x + 3$?

5	$\frac{2}{3} \times 3 + 3$
	$2 + 3$
	5

$\Rightarrow$ yes!

$m = \frac{2}{7}$

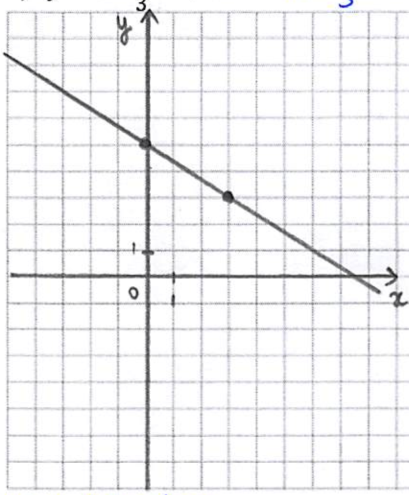
x	0	12
y	-8	0

iii) Graph the following lines:

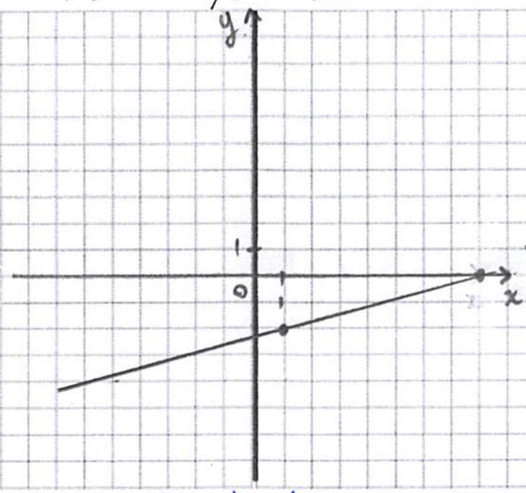
a) $y = -\frac{2}{3}x + 5$ $m = -\frac{2}{3}$

b) $y + 2 = \frac{2}{7}(x - 1)$

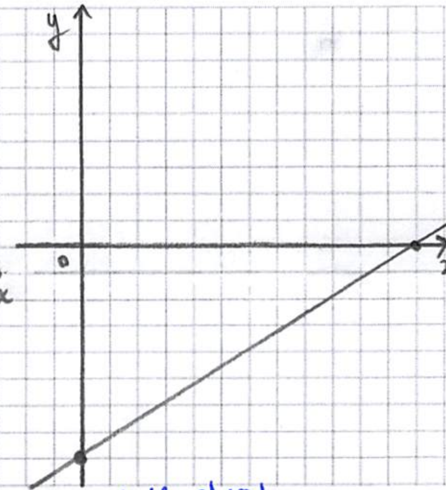
c) $2x - 3y = 24$



use y-int + slope



use $P(1;-2)$ + slope



use a table of values

Reminders: Parallel lines have the same slope

Perpendicular lines have slopes that are opposite and reciprocals. ex: $m_1 = \frac{2}{3}$ & $m_2 = -\frac{3}{2}$

2) **Quadratic functions:** The graphs will be parabolas (opening up or down)

Factored form

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

Great for the zeros

General Form

$y = 2x^2 - 4x - 5$

Great for y-int

Vertex: $\left(\frac{-b}{2a}; ?\right)$

Vertex Form

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

Great for the vertex

Examples:

a) $y = x^2 - 2x - 15$

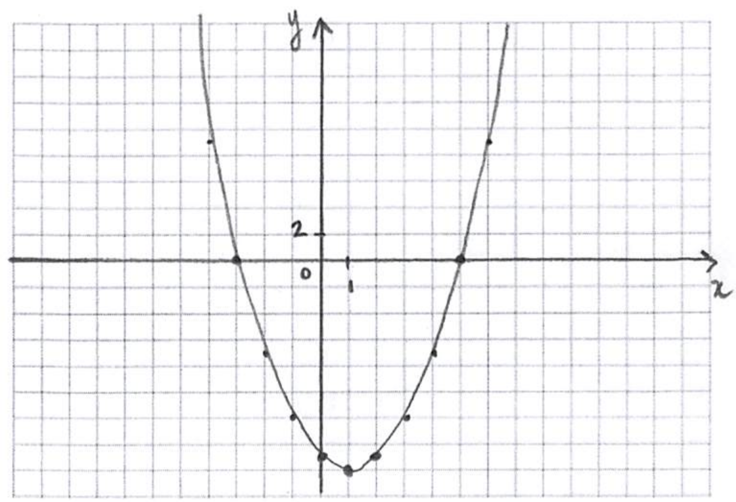
vertex: $(1;-16)$

zeros: $(x-5)(x+3)$

$x = 5$ $x = -3$

y-int: -15

x	3	4	6
y	-12	-7	9



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

vertex : $(1;5)$

y-int : 7

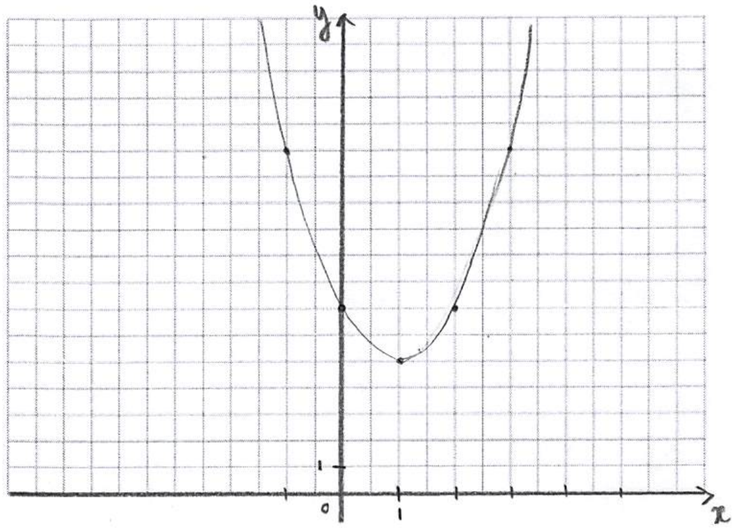
zeros : $2(x-1)^2+5=0$

$(x-1)^2 = -5/2 \rightarrow$ none

or

$\cup$ 5 $\Rightarrow$ none

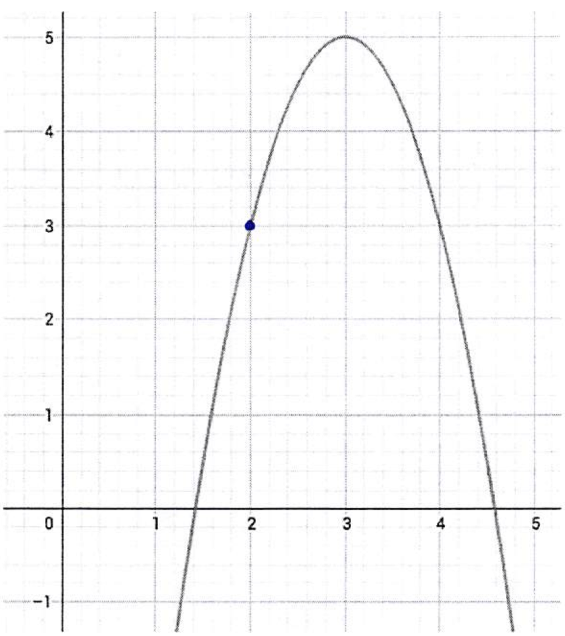
x	2	3	4
y	7	13	23



To determine the zeros, you can factor, or use the quadratic formula $\left(\Delta = b^2 - 4ac \quad and \;\; x = \frac{-b\pm\sqrt{\Delta}}{2a}\right)$

To determine the equation of a parabola given its graph, use the vertex form and determine p, q, and then *a* (using the coordinates of a point on the graph).

Example:



$y = a(x-p)^2 + q$

vertex : $(3;5)$

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

point used : $(2;3)$ for example.

$3 = a(2-3)^2 + 5$

$3 = a + 5$

$-2 = a$

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

3) **Absolute Value functions:** The absolute value transforms any number into a positive number…

vertex: $(1, -16)$

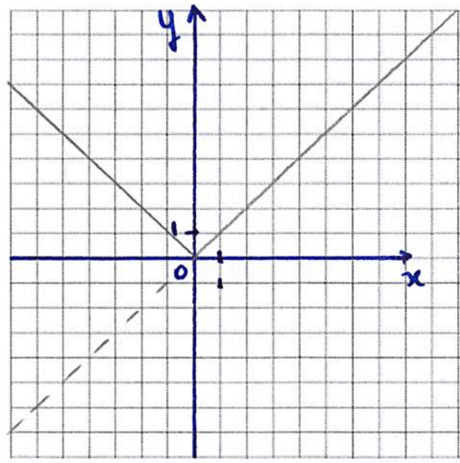
Examples: $|-5| = 5$; $|5| = 5$

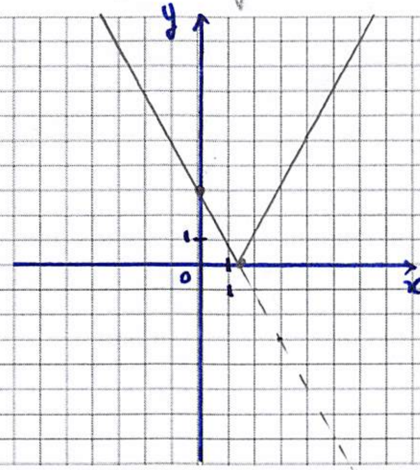
Examples: 1) $y = |x|$ 2) $y = |-2x+3|$ 3) $y = |x^2 - 2x - 15|$

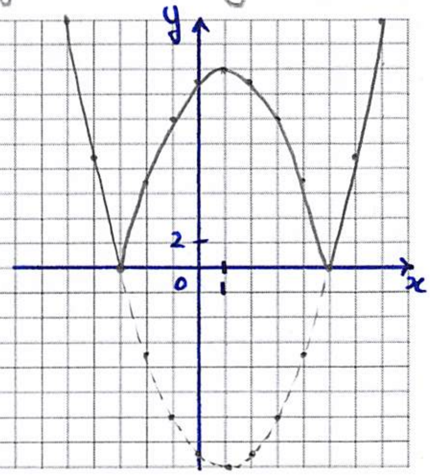
we can start by ignoring the absolute value and graph:

$y = x$ $y = -2x + 3$ $y = x^2 - 2x - 15$

and keep the positive part of the graph & reflect the negative one.







zero: $-2x + 3 = 0$
$2x = 3$
$x = 3/2$

zeros: -3 and 5

Piecewise definition:

$y = |x|$ $y = |-2x+3|$ $y = |x^2 - 2x - 15|$

$$y = \begin{cases} x \text{ if } x \geq 0 \\ -x \text{ if } x < 0 \end{cases}$$

$$y = \begin{cases} -2x+3 \text{ if } x \leq \frac{3}{2} \\ 2x - 3 \text{ if } x > \frac{3}{2} \end{cases}$$

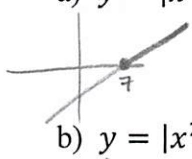
$$y = \begin{cases} x^2 - 2x - 15 \text{ if } x \leq -3 \text{ or } x \geq 5 \\ -x^2 + 2x + 15 \text{ if } -3 < x < 5 \end{cases}$$

D = $\mathbb{R}$ D = $\mathbb{R}$ D = $\mathbb{R}$

R = $[0, +\infty)$ R = $[0, +\infty)$ R = $[0, +\infty)$

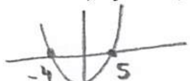
Your turn: Define the following absolute values piecewise:

a) $y = |x - 7|$



$$y = \begin{cases} x - 7 \text{ if } x \geq 7 \\ -x + 7 \text{ if } x < 7 \end{cases}$$

b) $y = |x^2 - x - 20|$



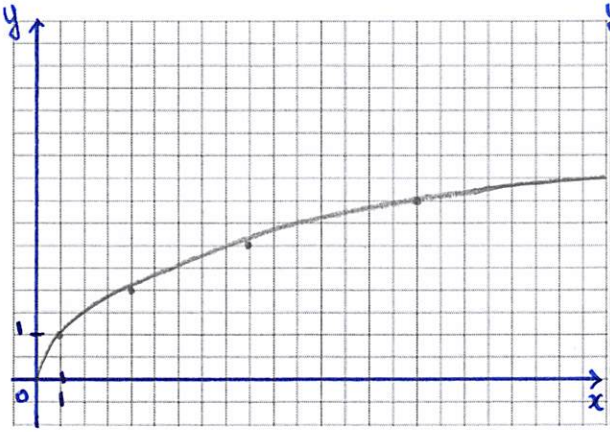
$$y = \begin{cases} x^2 - x - 20 \text{ if } x \leq -4 \text{ or } x \geq 5 \\ -x^2 + x + 20 \text{ if } -4 < x < 5 \end{cases}$$

$(x-5)(x+4)$

4) Square Root functions:

Examples: 1) $y = \sqrt{x}$

x	0	1	4	9	16
y	0	1	2	3	4

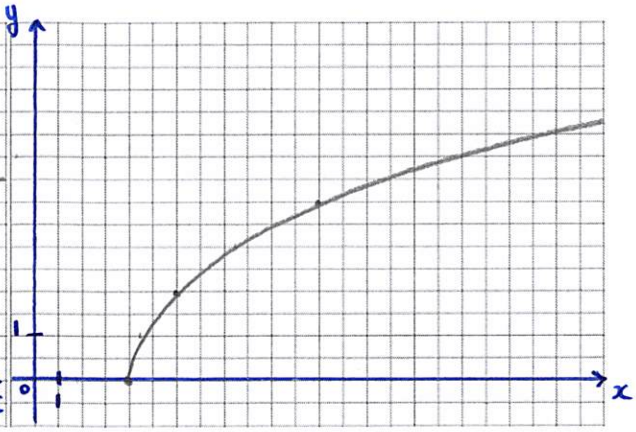


D = $[0, +\infty)$

R = $[0, +\infty)$

2) $y = \sqrt{2x - 8}$

x	4	4.5	6	8.5	12
y	0	1	2	3	4



D = $[4, +\infty)$

R = $[0, +\infty)$

Hwk: converting quadratics worksheet &. Usual functions worksheet

III – Solving Usual Equations:

1) **Algebraically:**
This should be the default method.
Each type of equation will be solved differently, because there isn't 1 method that works for them all.
SEE ORGANIZER

2) **Graphically:**
This method is only used when we don't know how to solve the equation algebraically (if it isn't a usual type of equation) or if we don't need to be precise. Graphing calculators (or technology in general) will help us do it fast and with great approximations.
The idea is to graph each side of the equation separately and look for the intersection points…
(x values only)

Hwk: Usual equations worksheet & p 96 # 2 – 4, 6, 7, 11, 13, 14
Review 2.3 p 100 – 101 & p 102 # 2, 7, 12