1. This question will ask you to work with the numeric expression $3-2-5-6-3$.

   a. Evaluate the expression $-(3-2-5-6-3)$.

   (1 mark)

   $= -(-13)$

   $= 13$ A1

   b. Evaluate the expression $-|3-2-5-6-3|$.

   (1 mark)

   $= -|-13|$

   $= -(13) = -13$ A1

   c. Explain WHY your answers in Q(a) and Q(b) differ.

   (1 mark)

   the numeric expression has a value of −13. when you take the absolute value of −13, you get +13. But when you negate the +13, you get −13 in Q1b. R1

   In Q1a, the −13 value is simply negated, to produce the +13 final value.

2. In this question, you will work with the functions $f(x) = B - 2x$ (where $B > 0$) and $g(x) = |x|$.

New equations are formed when you compose with these two functions.

a. The new equation for $y = f \circ g(x)$ is:

$y = f(|x|) = B - 2|x|$

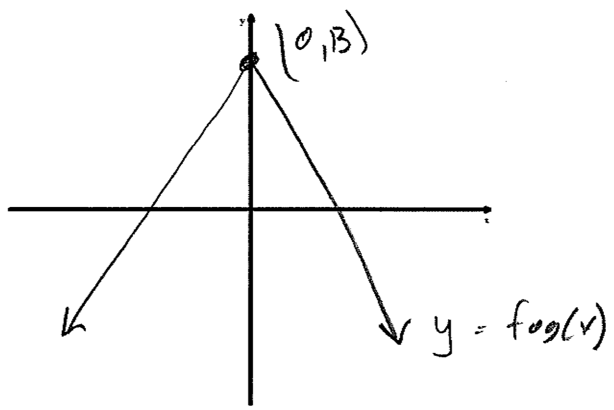
(1 mark)

b. The new equation for $y = g \circ f(x)$ is:

(1 mark)

$y = g(B - 2x) = |B - 2x|$

c. On the axes, sketch the function $y = f \circ g(x)$, given that $B > 0$.



$f \circ g(x) = B - 2|x|$

1 pt ⇒ shape
1 pt ⇒ key points

(2 marks)

d. Explain how the graph of $g(x) = |x|$ has been transformed into the graph of $y = f \circ g(x)$.

(3 marks)

(i) shifted/translated <u>up</u> by B units

(ii) Reflected accross the x-axis

(iii) horizontal compression by a factor of 2

2. In this question, you will continue to work with the functions $f(x) = B - 2x$ (where $B > 0$) and $g(x) = |x|$ and the composition $y = f \circ g(x)$

A solution to the equation $f \circ g(x) = 0$ is $x = \frac{\pi}{2}$.

e. Explain the graphical significance of the equation $f \circ g(x) = 0$.

we are referring to finding the x-intercepts

(1 mark)

f. Hence or otherwise, determine the value of B.

(1 mark)

$F \circ g\left(\frac{\pi}{2}\right) = 0$

$0 = B - 2\left|\left(\frac{\pi}{2}\right)\right|$ ✓ M_1

$0 = B - \pi$

$\therefore B = \pi$ ✓ A_1

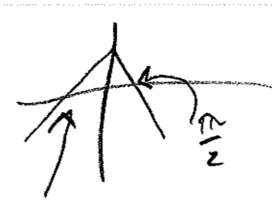
g. Determine the other solution(s) to the equation $f \circ g(x) = 0$.

(1 mark)

$\pi - 2|x| = 0$

$\pi = 2|x|$ OR use symmetry in graph

$\frac{\pi}{2} = |x|$



$\therefore x = \pm \frac{\pi}{2}$

$\therefore -\frac{\pi}{2}$

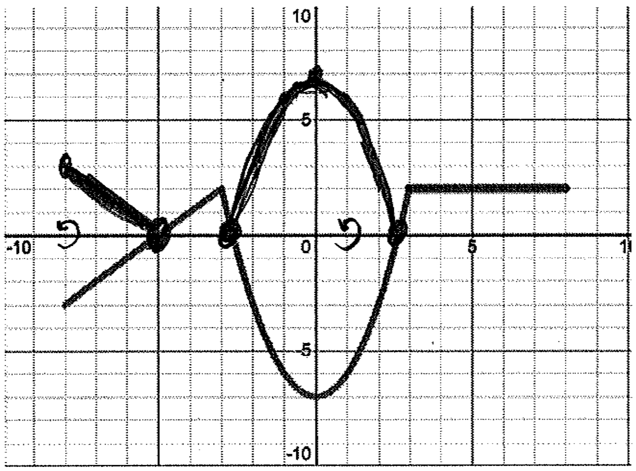
✓

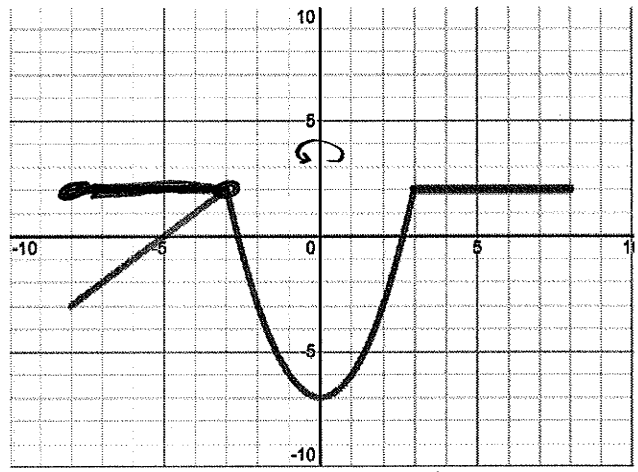
A_1 so the other soln is $-\frac{\pi}{2}$

3. A graph of $y = f(x)$ is provided. The domain of $y = f(x)$ is $\{x \in R \mid -8 \le x \le 8\}$.

a. On the same axes, graph $y = |f(x)|$.

b. On the same axes, graph $y = f(|x|)$.





(2 marks) **(2 marks)**

$|f(x)|$ makes ALL outputs/ values positive, so we have a reflection across the x-axis of all negative parts

i.e ~~∅~~ use $x = -8$ $(-8, 2)$ $(5, 2)$

$f|-8| = f(8) = +2$

$f|-5| = f(5) = +2$

etc.

c. Give a BRIEF explanation as to WHY the two graphs appear different.

(1 mark)

Since $|f(x)|$ returns positive outputs, all negative values of $f(x)$ are made positive

d. Give a BRIEF explanation as to WHY the two graphs appear different.

(1 mark)

We now change the input numbers. So all negative x values are made positive BEFORE they get evaluated in the function.