8. Given that a is a positive constant,

(a) on **separate** diagrams, sketch the graph with equation

(i) $y = a - |x|$

(ii) $y = |3x - 2a|$

Show on each sketch the coordinates, in terms of a, of each point at which the graph crosses or meets the axes.

(4)

(b) Find, in terms of a, the values of x for which

$$a - |x| = |3x - 2a|$$

(4)

(Total for Question 8 is 8 marks)

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9. (a) Given that $-\frac{\pi}{2} < \mathrm{g}(x) < \frac{\pi}{2}$, sketch the graph of $y = \mathrm{g}(x)$ where

$$\mathrm{g}(x) = \arctan x \qquad x \in \mathbb{R}$$

(2)

(b) Find the exact value of x for which

$$3\mathrm{g}(x + 1) - \pi = 0$$

(2)

The equation $\arctan x - 4 + \frac{1}{2}x = 0$ has a positive root at $x = \alpha$ radians.

(c) Show that $5 < \alpha < 6$

(2)

The iteration formula

$$x_{n+1} = 8 - 2\arctan x_n$$

can be used to find an approximation for α

(d) Taking $x_0 = 5$, use this formula to find x_1 and α, giving each answer to 4 decimal places.

(3)

(Total for Question 9 is 9 marks)

TOTAL FOR PAPER IS 75 MARKS