Q1

i) MANY TO ONE

$\tan 60 = \sqrt{3}$

$\tan 240 = \sqrt{3}$

ii) MANY TO ONE

$\left|\frac{1}{2}\right| = \left|\frac{1}{-2}\right|$

iii) MANY TO ONE

$\sqrt{2^2} = 2$

$\sqrt{-2^2} = 2$

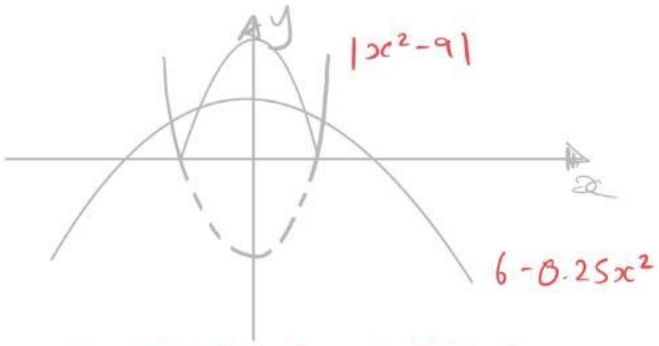
$\sqrt{}$ ROOT WILL ALWAYS GIVE NON NEGATIVE VALUE

iv) MANY TO MANY

$\neq \sqrt{25-4^2} = \neq 3$

$\neq \sqrt{25-(-4)^2} = \neq 3$

Q2



$$|x^2-9| = 6 - 0.25x^2$$

$x^2-9 = 6-0.25x$

$1.25x^2 = 15$

$x^2 = 12$

$x = \pm\sqrt{12}$

$x = \pm 2\sqrt{3}$

$x^2-9 = -6+0.25x^2$

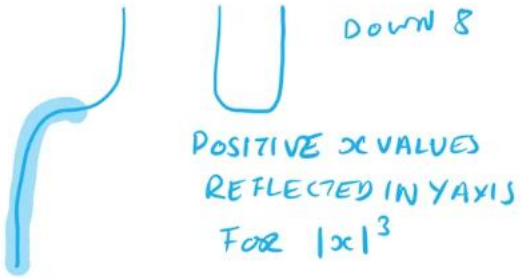
$0.75x^2 = 3$

$x^2 = 4$

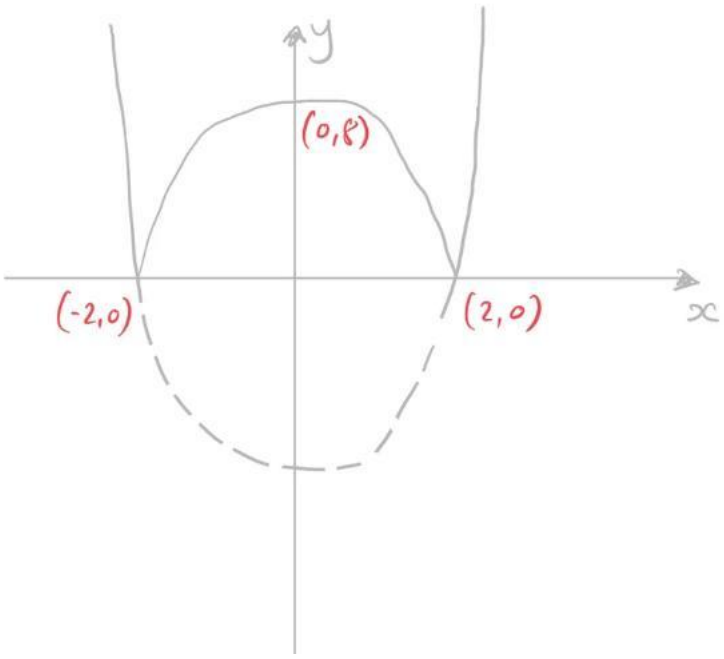
$x = \pm 2$

$x = \pm 2\sqrt{3}$ $\quad$ $x = \pm 2$

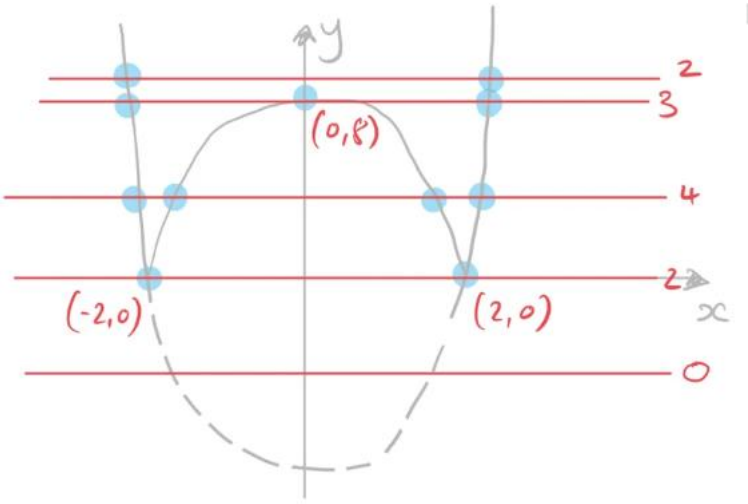
Q3a



a) $fg(x) = |x|^3 - 8|$



Q3b



b)

$c < 0$ NO SOLUTIONS

$c = 0$ OR $c > 8$ TWO SOLUTIONS

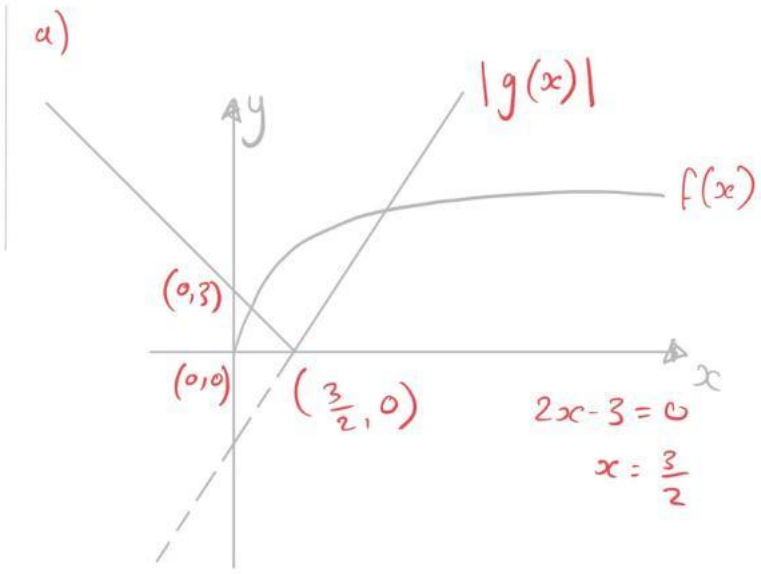
$c = 8$ THREE SOLUTIONS

$0 < c < 8$ FOUR SOLUTIONS

NO VALUE OF c FOR ONE SOLUTION

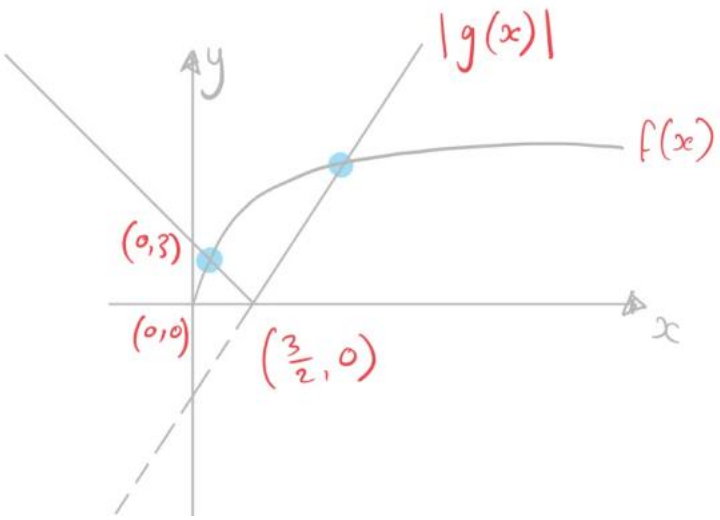
Q4a

a)



Q4b

[1



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b) SOLVE MOD EQUATION BY SQUARING BOTH SIDES

$$\sqrt{x} = |2x - 3|$$

SQUARE

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

$$x = 4x^2 - 12x + 9$$

$$4x^2 - 13x + 9 = 0$$

$$(4x - 9)(x - 1)$$

$$x = \frac{9}{4} \qquad x = 1$$

Q4b

b) SOLVE MOD EQUATION BY SQUARING BO

$$\sqrt{x} = |2x - 3|$$

SQUARE

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

$$x = 4x^2 - 12x + 9$$

$$4x^2 - 13x + 9 = 0$$

$$(4x - 9)(x - 1)$$

$$x = \frac{9}{4} \qquad x = 1$$

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Q4c

c) $x = 1$ $\quad x = \frac{9}{4}$

$f(x) = g(x)$

$x = 1$ IS NOT A SOLUTION

Q5a

a) HORIZONTAL STRETCH SF 2
VERTICAL STRETCH SF $\frac{1}{4}$
MOD REFLECTION ABOVE X AXIS
VERTICAL REFLECTION IN X AXIS

USE $f(x)$ FUNCTION TO CALCULATE ABC

$A = (2, 0)$ $\quad B = (8, 0)$ $\quad C = (5, 9)$

TRANSFORM CO-ORDINATES TO FIND A'B'C'

$A' = (4, 0)$ $\quad B' = (16, 0)$ $\quad C' = (10, -2.25)$

Q5b

b) USING COORDINATES FOR ABC AND A'B'C'

$A = (2, 0)$ $B = (8, 0)$ $C = (5, 9)$

$A' = (4, 0)$ $B' = (16, 0)$ $C' = (10, -2.25)$

AREA $\frac{1}{2}bh$

ABC $\frac{1}{2}(8-2) \times 9 = 27$

A'B'C' $\frac{1}{2}(16-4) \times 2.25 = 13.5$

ABC = 27 UNITS^2 A'B'C' = 13.5 UNITS^2

$ABC = 2(A'B'C')$

Q6

$$f(x) = e^{3x} - x - 6$$

1. x MULTIPLIED BY $\frac{1}{3}$

$$f\left(\tfrac{1}{3}x\right) = e^{3\left(\frac{1}{3}x\right)} - \tfrac{1}{3}x - 6$$

$$= e^{x} - \tfrac{1}{3}x - 6$$

2. MODULUS

$$\left| f\left(\tfrac{1}{3}x\right) \right| = \left| e^{x} - \tfrac{1}{3}x - 6 \right|$$

3. HORIZONTAL REFLECTION

$$\boxed{\left| f\left(-\tfrac{1}{3}x\right) \right| = \left| e^{-x} + \tfrac{1}{3}x - 6 \right|}$$

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Q7a

a) USING SOH CAH TOA

i) $O = \sin\theta \times H = x$

$$x = 18\sin\theta$$

ii) $A = \cos\theta \times H = 20 - y$

$$y = 20 - \cos\theta \times H$$

$$y = 20 - 18\cos\theta$$

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Q7b

b) $-1 \leq \cos\theta \leq 1$

i) IF $\cos\theta$ IS NEGATIVE $-18\cos Bt$ WOULD BE POSITIVE

MODULUS IS NEEDED TO PREVENT Y-COORDINATE GOING ABOVE 20 WHICH IS THE MAX POSSIBLE HEIGHT

$0 \leq \theta \leq \frac{\pi}{2}$ COVERS HALF OF SEMI CIRCLE

ii) 8 SECONDS = π $\quad 180° = \pi$

$8B = \pi$

$B = \frac{\pi}{8}$

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Q7c

c) $y = x$ ON EQUATION OF CIRCLE

$(x-a)^2 + (y-b)^2 = r^2$ $\quad (a,b) = (0,20)$, $r = 18$

$x^2 + (y-20)^2 = 18^2$

$x^2 + y^2 - 40y + 400 = 324$

SUB $y = x$

$2x^2 - 40x + 76 = 0$

$x = 10 \pm \sqrt{62}$ $\quad x = 18\sin\left(\frac{\pi}{8}t\right)$

$\sin\left(\frac{\pi}{8}t\right) = \frac{10 \pm \sqrt{62}}{18}$

$\sin^{-1}$

$\frac{\pi}{8}t = 0.11838\ldots$ $\quad 1.452\ldots$

$t = 0.30147\ldots$ $\quad t = 3.6985\ldots$

$t = 0.3$ SECONDS AND $t = 3.7$ SECONDS