MEI CORE 3 MODULUS FUNCTION REVISION

1) $|3x+2| = 1$

Either $3x + 2 = 1$

$3x = 1 - 2$

$3x = -1$

$x = -\frac{1}{3}$

or $3x + 2 = -1$

$3x = -1 - 2$

$3x = -3$

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

$x = -1$

Solutions:

$x = -\frac{1}{3}$

or $x = -1$

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2) $|3x - 2| = x$

Either $3x - 2 = x$

$3x - x = 2$

$2x = 2$

$x = 1$

or $3x - 2 = -x$

$3x + x = 2$

$4x = 2$

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

Solutions:

$x = 1$

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

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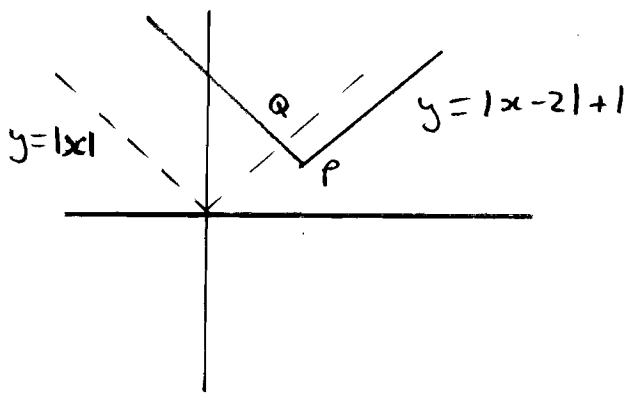
3)



i) $P(2, 1)$

ii) Consider $y = \frac{3}{2}$ for both graphs

$y = |x|$ when $y = \frac{3}{2}$, $x = \frac{3}{2}$

$y = |x-2|+1$

When $y = \frac{3}{2}$

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

$\frac{3}{2} - 1 = |x - 2|$

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

Either $x - 2 = \frac{1}{2} \Rightarrow x = \frac{5}{2}$

or $x - 2 = -\frac{1}{2} \Rightarrow x = \frac{3}{2}$

∴ at $(\frac{3}{2}, \frac{3}{2})$ the graphs intersect.

3ii) Alternative solution

The sections of the graphs that intersect are

$y = x$ ①

and $y = -x + 2 + 1$

$y = -x + 3$ ②

Solve ① and ② simultaneously

Subst for y in ②

$$x = -x + 3$$

$$x + x = 3$$

$$2x = 3$$

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

Sub for x in ① $y = \frac{3}{2}$

$\therefore$ intersection at $\left(\frac{3}{2}, \frac{3}{2}\right)$

4) $|2x - 1| \leq 3$

$$-3 \leq 2x - 1 \leq 3$$

$$-3 + 1 \leq 2x \leq 3 + 1$$

$$-2 \leq 2x \leq 4$$

$$-\frac{2}{2} \leq x \leq \frac{4}{2}$$

$$-1 \leq x \leq 2$$

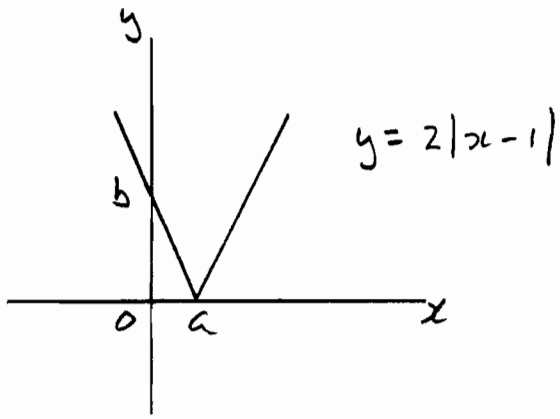
5) $|x - 1| < 3$

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

$$-3 + 1 < x < 3 + 1$$

$$-2 < x < 4$$

6)



When $x = 0$, $y = 2|0 - 1|$

$y = 2 \times 1 = 2$

$\therefore b = 2$

When $y = 0$, $2|x - 1| = 0$

$\Rightarrow x - 1 = 0$

$\Rightarrow x = 1$

$\therefore a = 1$