

Attempt all questions. Show all working. Use your own paper.

1. Solve for x :

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

(b) $-7 < 3 - 5x \leq 3$,

(c) $x^2 \leq 16$

2. Evaluate the following

(a) $|-4| - |-7|$

(b) $|-3 + 6 - 10|$

3. (a) If $x = -7$, evaluate $|x + 3|$.

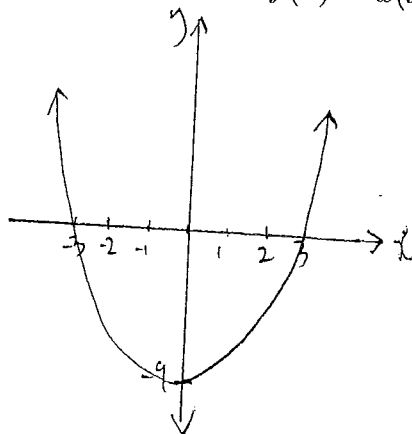
(b) Solve the equation $|x + 3| = 2$.

(c) Solve the inequation $|5x + 3| \leq 2$ and graph the solution on a number line.

4. Sketch the graph of $y = (x - 2)(x + 3)$. Hence, solve $y = (x - 2)(x + 3) > 0$

5. Determine algebraically whether the function $f(x) = x(x^2 - 2)$ is even, odd or neither.

6.



The graph of $y = (x - 3)(x + 3)$ is sketched above.

(a) Carefully sketch the graph of $y = |(x - 3)(x + 3)|$.

(b) State if the function $y = |(x - 3)(x + 3)|$ is even, odd or neither.

8. (a) Sketch $y = |x - 1|$ and $y = 2x + 3$ on the same number plane.

(b) Find, algebraically, the points of intersection of the two graphs.

(c) Hence solve $|x - 1| < 2x + 3$.

9. (a) Sketch the union of $x^2 + y^2 \leq 1$ and $y > 2 - x$.

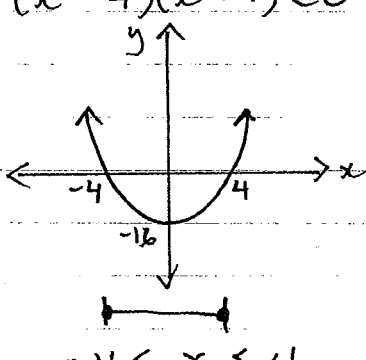
(b) What is the intersection of these two regions?

2G Graphs + Inequalities

1 a) $4x - 1 < -9$
 $4x < -8$
 $x < -2$ ✓

b) $-\frac{7}{3} < 3 - 5x \leq \frac{3}{-3}$
 $-\frac{10}{-5} < -5x \leq \frac{0}{-5}$ ✓
 $2 > x \geq 0$ ✓
 $0 \leq x < 2$ ✓

c) $x^2 \leq 16$
 $x^2 - 16 \leq 0$
 $(x-4)(x+4) \leq 0$ *quadratic inequality*
draw a diagram



✓
 $-4 \leq x \leq 4$ ✓

2 a) $|-4| - |-7| = 4 - 7$
 $= -3$ ✓

b) $|-3+6-10| = |3-10|$
 $= |-7|$
 $= 7$ ✓

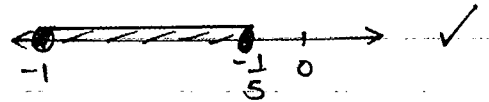
3 a) $|x+3| = |-7+3|$
 $= |-4|$
 $= 4$ ✓

b) $|x+3| = 2$
 $x+3 = 2$ or $x+3 = -2$ ✓
 $x = -1$ $x = -5$ ✓

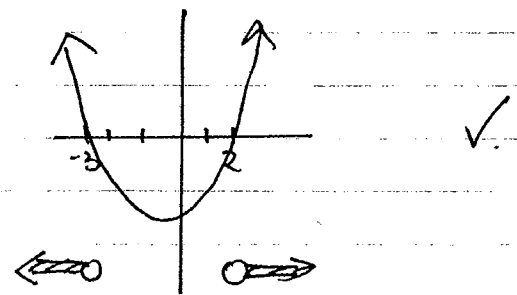
c) $|5x+3| \leq 2$
 $-2 \leq 5x+3 \leq 2$ ✓
 $-3 \leq 5x \leq -1$

$-\frac{5}{5} \leq 5x \leq \frac{-1}{5}$ ✓

$-1 \leq x \leq -\frac{1}{5}$



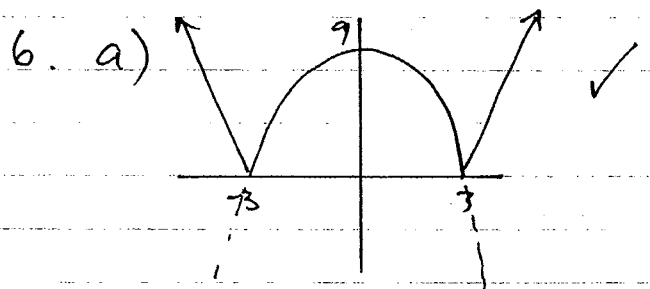
4. $y = (x-2)(x+3)$



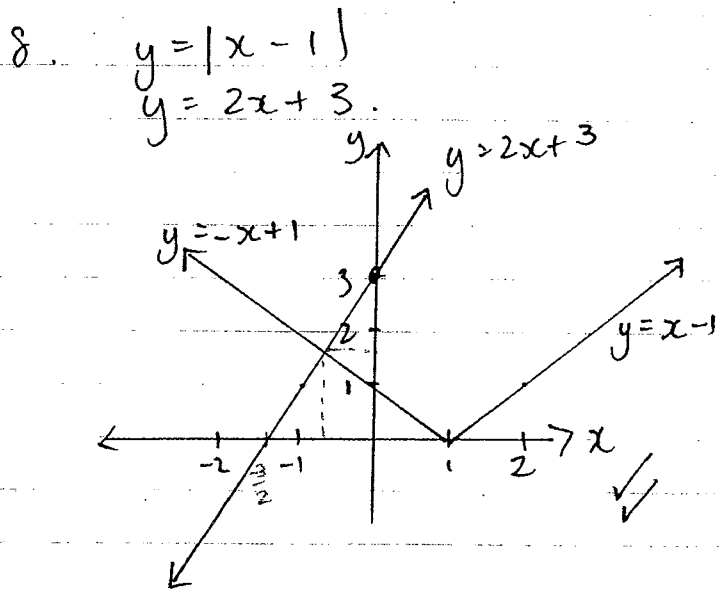
$(x-2)(x+3) > 0$
 $x < -3$ $x > 2$ ✓

5. $f(x) = x(x^2 - 2)$
 $f(-x) = -x((-x)^2 - 2)$
 $= -x(x^2 - 2)$
 $= -f(x)$
 $-f(x) = -x(x^2 - 2)$

$f(-x) \neq f(x) \therefore$ not even
 $f(-x) = -f(x)$
 so function is odd. ✓



b) $y = |(x-3)(x+3)|$ symmetrical about y-axis
 \therefore even. ✓



Branch of $y = |x-1|$ required to work at intersection is $y = -x+1$ ✓

$$y = -x+1 \quad \textcircled{1}$$

$$y = 2x+3 \quad \textcircled{2}$$

$$\textcircled{1} = \textcircled{2}$$

$$-x+1 = 2x+3$$

$$-3x = 2$$

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

Sub $x = -\frac{2}{3}$ into $\textcircled{1}$

$$y = -\left(-\frac{2}{3}\right) + 1$$

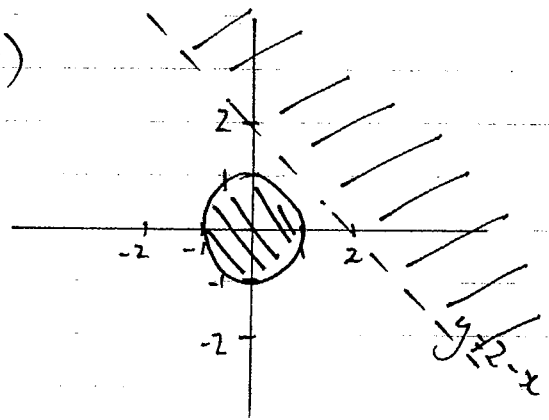
$$= 1\frac{2}{3}$$

Point of intersection $\left(-\frac{2}{3}, 1\frac{2}{3}\right)$ ✓

c) $|x-1| < 2x+3$

$$x > -\frac{2}{3} \quad \checkmark$$

9. a)



$$y = 2-x$$

$$= -x+2$$

$y > 2-x$ broken line for boundary ✓

$$x^2 + y^2 = 1 \quad \text{circle radius: 1}$$

centre: origin (0,0)

$x^2 + y^2 \leq 1$ solid line for boundary ✓

Union is and together ✓

b) No intersection ✓

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