1.

   a. Express

   $$\frac{3}{x} - \frac{5+x}{2x} + \frac{1}{4}$$

   as a single fraction in its simplest form. [3]

   $$\frac{3}{x} - \frac{5+x}{2x} + \frac{1}{4} = \frac{12}{4x} - \frac{10+2x}{4x} + \frac{x}{4x} \quad \text{(M1) oe}$$

   $\times 4 \qquad \times 2 \qquad \times 4x$

   $$= \frac{12 - 10 - 2x + x}{4x} \quad \text{(M1) oe}$$

   $$= \frac{2-x}{4x} \quad \text{(A1)}$$

   b. Make q the subject of the equation
   $$p = \frac{q-1}{q+1}$$ [3]

   $$p(q+1) = q-1 \implies pq + p = q - 1 \quad \text{(M1)}$$

   $$\implies pq - q = -p - 1$$

   $$\implies q - pq = p + 1$$

   $$\implies q(1-p) = p+1 \quad \text{(M1) for attempt at factorising}$$

   $$\implies q = \frac{p+1}{1-p} \quad \text{oe (A1)}$$

2. Solve the inequality and draw it on the number line: $2x - 4 > 5(x - 5)$

$2x - 4 > 5x - 25$ (M1) for algebraic work

$-4 > 3x - 25$

$21 > 3x$ $x < 7$ (A1)

must show arrow   must be open

$\longleftarrow$ O (A1)

-4   -3   -2   -1   0   1   2   3   4   5   6   7   8   9   10
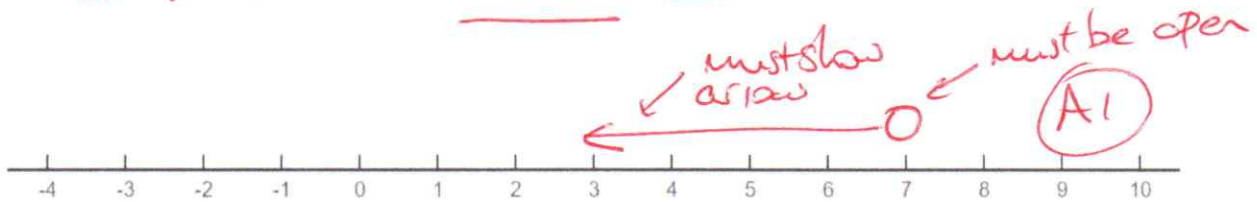
[3]

3. A curve has the equation $y = 4x^3 + \frac{1}{2}x^2$. Show that the graph of this curve has two turning points, one of which is the origin, and find the x-coordinate of the other. [4]

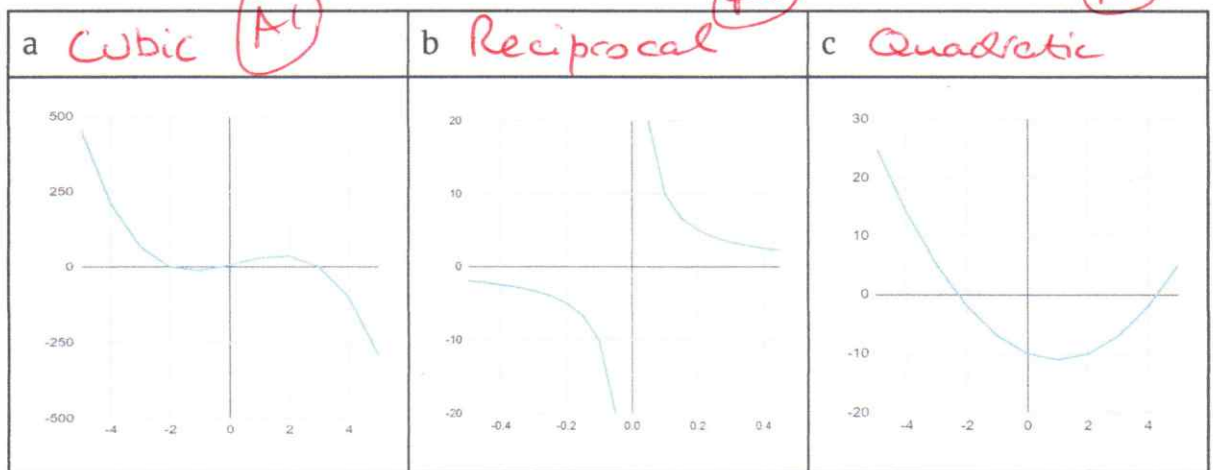$y = 4x^3 + \frac{1}{2}x^2$ $\frac{dy}{dx} = 12x^2 + x$ (M1)

At turning point $\frac{dy}{dx} = 0$

$\Rightarrow 0 = 12x^2 + x$ (M1) for setting $= 0$

$= x(12x + 1)$ (M1)

$\Rightarrow x = 0$ or $x = \dfrac{-1}{12}$ (A1)

4. Identify the types of function in each of these graphs as Linear, Quadratic, Cubic or Reciprocal: **[3]**

a Cubic	b Reciprocal	c Quadratic

5. A long distance runner is training for a race. She runs 26 km at a constant speed of 6 kph, then speeds up for the final 15km, running at a speed of 9 kph. What is her average speed for the whole run? **[4]**

$$\frac{d}{s \; t}$$

	d (km)	s (kph)	t (h)
I	26	6	26/6
II	15	9	15/9
Total	41 $= 41/6$		6

$$\Rightarrow = 6.8 \; km/h$$

6. Five children on a rollercoaster have an average (mean) mass of 28kg. Two get off; the mean weight of these two is 26.5kg. What is the mean weight of the remaining children on the ride? **[3]**
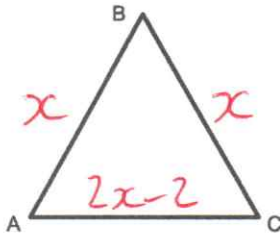
	Children	Mean	Total mass (kg)
Originally	5	× 28 =	140
2 get off	2	× 26.5 =	53
3 left on	3		87

$$Mean = \frac{87}{3} = 29 \, kg$$

8
10. Triangle ABC is isosceles and has dimensions as follows:
AB = BC = x.
AC = 2x − 2.

B
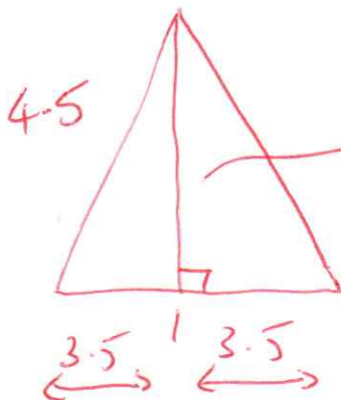x /\ x
$2x-2$
A   C

The triangle has a perimeter of 16cm.
Find the area of the triangle.   [5]

$P = x + x + 2x - 2 = 4x - 2$ (M1)

$16 = 4x - 2 \Rightarrow 4x = 18$ $x = \dfrac{18}{4} = \dfrac{9}{2} = 4.5$ cm (M1)

4.5

$h^2 = 4.5^2 - 3.5^2$ (M1) for pythagoras with their x

$h = \sqrt{8} = 2\sqrt{2} = 2.83$

3.5 | 3.5

(M1) for $\frac{1}{2}bh$ with their h

$A = \dfrac{1}{2} \times b \times h = \dfrac{1}{2} \times 7 \times 2.83$

$= 9.90 \text{ cm}^2$ (A1) Must be rounded correctly