MARK SCHEME

Student number:

Pure Maths – Test 3 – Version A   **Total Marks = 25**

You may use a calculator but **you must show your method**.

Formulae   <u>Trigonometry</u>

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad\qquad a^2 = b^2 + c^2 - 2bc\cos A \qquad\qquad \text{Area of triangle} = \frac{1}{2}ab\sin C$$

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1) Find $f'(t)$ when

$$f(t) = \frac{6}{t} + 4\sqrt{t}$$

$$= 6t^{-1} + 4t^{\frac{1}{2}}$$

M1 for changing to index form

$$f'(t) = -6t^{-2}$$

A1

$$+2t^{-\frac{1}{2}}$$

A1

Total = 3

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2) Differentiate $y = \frac{(3x+2)(x-4)}{2x}$ with respect to x

$$= \frac{3x^2 - 10x - 8}{2x}$$

$$= \frac{3}{2}x - 5 - \frac{4}{x}$$

M1 for expanding and simplifying

A1 if fully correct

$$\therefore \frac{dy}{dx} = \frac{3}{2}$$

A1

$$-\frac{4}{x^2} \quad or \quad -4x^{-2}$$

A1

Lose 1 mark if any additional terms

Total = 3

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3) Find the gradient of the curve $y = x^4 - x^3 + x^2 + 5x + 2$ at the point $(-1, 0)$

$$\frac{dy}{dx} = 4x^3 - 3x^2 + 2x + 5$$

B1 for this answer only

At $x = -1$,

$$\frac{dy}{dx} = 4(-1)^3 - 3(-1)^2 + 2(-1) + 5$$

M1 for substituting $x = -1$

$$= -4$$

A1

Total = 3

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4) Find the co-ordinates of the point on the line $y = 4x^2 - 7x + 2$ where the gradient is 5

$$\frac{dy}{dx} = 8x - 7$$

let $5 = 8x - 7$
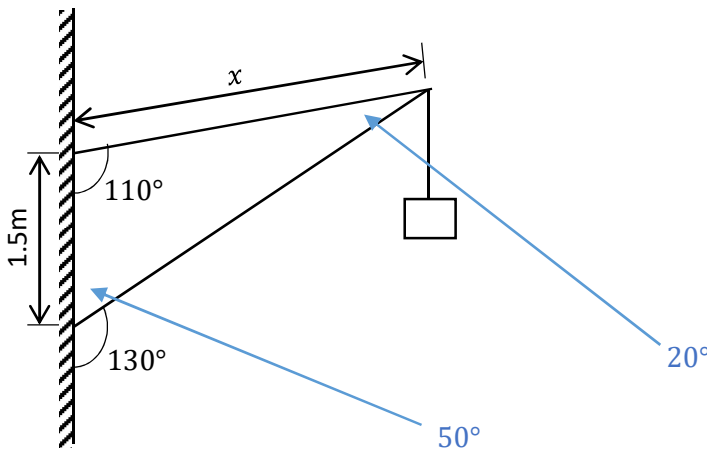
M1 for differentiating <u>and</u> equating to gradient

$$\therefore x = -2$$

A1 for x

$$y = 4(-2)^2 - 7(-2) + 2$$

$$= 0.5$$

A1ft for y (follow through from their x)

$\therefore$ the co-ordinates are $(-2, 0.5)$

B1 for writing their x and y as a co-ordinate pair

Total = 4

6. A triangle has sides of length 8cm, 10cm and 15cm.			

a) Find the size of the smallest angle in the triangle. [3 marks]		b) Find the area of the triangle. [3 marks]	
Cosine rule can be quoted in either arrangement $8^2 = 10^2 + 15^2 - 2 \times 10 \times 15 \times \cos A$ $\therefore \cos A = \dfrac{10^2 + 15^2 - 8^2}{2 \times 10 \times 15}$ $= 0.87$ $\therefore A = 29.5°$	M1 for using cosine rule A1 for correct substitution A1 (condone missing degree symbol)	$\text{Area} = \dfrac{1}{2} ab \sin C$ $= \dfrac{1}{2} \times 10 \times 15 \times \sin 29.5°$ $= 36.98\text{cm}^2 \ or \ 37.0\text{cm}^2 \ or \ 37\text{cm}^2$ Total = 6	M1 for using an area formula A1ft (follow through their A) B1 for correct units

7. The diagram shows a simple crane framework. Find length x. [6 marks]

	Angles might be seen on their diagram or simply used in their calculations.
Finds 50° angle	B1
Finds 20° angle	B1
$\dfrac{x}{\sin 50°} = \dfrac{1.5}{\sin 20°}$	M1 for using the sine rule A1ft for correctly substituting but follow through their previously found angles (NB A0 if using 130° and/or 110°)
$\therefore x = 3.36 \text{ m} \ \ or \ \ 3.4 \text{ m}$	A1ft for x (Only follow through if previous A mark gained) B1 for corrct units Total = 6 marks