

# Sec 4 A–Math WA1 Mock Exam Paper 2025

**Time Allowed:** 1 hour 15 minutes

**Total marks:** 45

**Instructions:**

- Answer all questions.
- Show your workings clearly.
- Marks are indicated for each question.
- Give your best shot!

**Additional materials:**

- Calculator
- 

1. Differentiate each of the following with respect to  $x$ . [6]

(a)  $x\sqrt{2-x}$

Answer: .....

(b)  $\frac{x}{\sqrt{x}-2}$

Answer: .....

(c)  $\pi x^\pi$

Answer: .....

- 2 A function is given by  $f(x) = 2x^3 - 15x^2 - 84x + k$ , where  $k$  is a constant.  
Find the range of values of  $x$  for which  $f(x)$  is a decreasing function. [3]

Answer: .....

3 The equation of a curve is  $y = \frac{\sqrt{x^2+1}}{7x+2}$ .

(i) Show that  $\frac{dy}{dx} = \frac{2x-7}{(7x+2)^2\sqrt{x^2+1}}$ . [5]

(ii) Hence find the exact value of  $\frac{dy}{dx}$  at the point where  $x = -1$ . [2]

Answer: .....

4 (a) Given that  $y = 4x^3 + 6x^2 + 9x + 2$ ,  
(i) show that  $\frac{dy}{dx} > 0$  for all real  $x$  and explain its significance, [3]

(ii) find the equation of the tangent at the point on the curve where the gradient is minimum. [3]

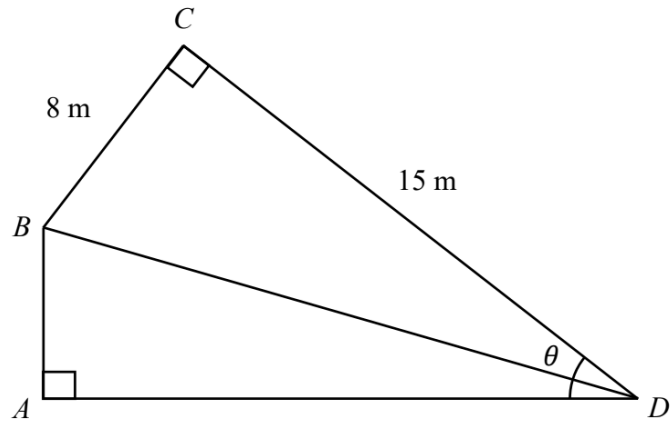
Answer: .....

(b) Given a curve with the equation  $y = x \ln(2x - 3)$ , find  $\frac{dy}{dx}$ . Hence, explain why the curve has no stationary point in the region  $x > 2$ . [4]

Answer

.....  
.....

5



The diagram shows a metal structure  $ABCD$  consisting of five metal rods of different lengths. The length of  $BC$  and  $CD$  are 8 m and 15 m respectively. Angle  $ADC = \theta$  for  $0^\circ < \theta < 90^\circ$ .

(a) Show that the total length,  $P$  m, of the five metal rods used is  $40 + 23 \sin \theta + 7 \cos \theta$ . [3]

(b) Express  $P$  in the form  $40 + R \sin (\theta + \alpha)$ , where  $R > 0$  and  $0^\circ < \alpha < 90^\circ$ . [2]

Answer: .....

(c) Find the value of  $\theta$  if the total length of the five metal rods is 60 m. [3]

Answer: .....

(d) Explain why the minimum value of  $\frac{1}{40 + [R \sin(\theta + \alpha)]^2}$  is  $\frac{1}{618}$ , and find the corresponding value of  $\theta$  for which it occurs. [4]

Answer: .....

6 (a) Find the value(s) of  $x$ , where  $-360^\circ < x < 0^\circ$ , for which  $\sin \frac{x}{2} + \sin x = 0$ . [4]

Answer: .....

(b) Find, without the use of calculators, the value(s) of  $x$ , where  $0 < x < \pi$ , for which  $\cos \left(2x - \frac{\pi}{5}\right) = \sin \frac{\pi}{5}$ . [3]

Answer: .....

**End of Paper**