

1. Given that $A = \begin{bmatrix} -2 & 0 \\ 4 & -1 \end{bmatrix}$, find B, given that $2A+B=A^2$. [4]

2. Find the distance between the points of intersection of $f(x)$ and $g(x)$ defined below.

$$f(x) = x^2 - 2x - 1 \quad g(x) = x + 3$$

Leave your answer as a surd. [6]

3. $f(x) = 3 - \sin 4x \quad 0 \leq x \leq 2\pi$

a) Find the amplitude and period of the function. [2]

b) Sketch the function, stating the maximum and minimum points. [4]

4. Consider the expression $(3 - 2x^2)^7$

a) Find the first 3 terms in the expansion above. [4]

b) Find the value of the coefficient of the x^{10} term. [2]

5. Given that $y = 2xe^{\frac{1}{2}x}$

Find,

a) $\frac{dy}{dx}$ [3]

b) $\frac{d^2y}{dx^2}$ [3]

c) Use your answers to a) and b) to find the coordinates of the turning point of $y = 2xe^{\frac{1}{2}x}$ and the nature of this point. [3]

6. The area of a rectangle is $(8 + 2\sqrt{2})\text{cm}^2$. Given that the width of the rectangle is $(4 - 2\sqrt{2})\text{cm}$, find the length of the rectangle giving your answer in the form $(a + b\sqrt{2})$, where a and b are rational numbers. [4]

7. Find the number of arrangements of LACHLAN,
- a) if you have no restrictions, [2]
 - b) if you must start with the letter L, [2]
 - c) begin and end with same letter. [3]

Five letters are taken at random from LACHLAN. Find the number of arrangements that can be made if,

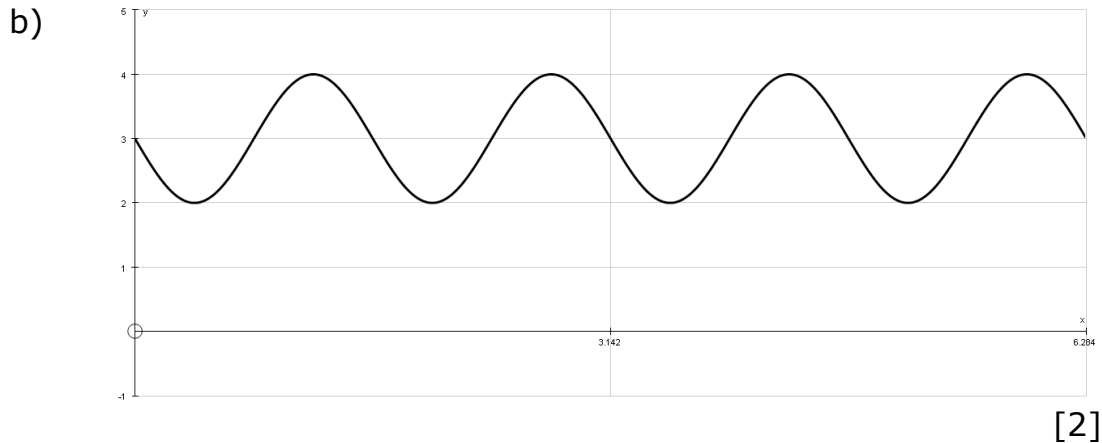
- d) the letters are all different, [2]
8. A plane flies from P to Q, where Q is due east of P. The distance of P from Q is 1800 km. A wind is blowing from the north-west at a speed of 130 km/h. Given that the plane completes its journey in exactly 3 hours 30 minutes, find the velocity (speed and direction) of the plane. [6]

Answers

1 $\begin{bmatrix} 8 & 0 \\ -20 & 3 \end{bmatrix}$ [4]

2 $5\sqrt{2}$ [6]

3 a) Amplitude = 1, period = $\pi/2$ [2]



maximum = 4, minimum = 2 [2]

4 a) $2187 - 10206x^2 + 20412x^4$ [4]

b) -6048 [2]

5 a) $\frac{dy}{dx} = e^{\frac{1}{2}x(x+2)}$ [3]

b) $\frac{d^2y}{dx^2} = e^{\frac{1}{2}x(\frac{x}{2}+2)}$ [3]

c) $(-2, -1.47)$ minimum point [3]

6 $5 + 3\sqrt{2}$ [4]

7 a) 1260 [2]

b) 360 [2]

c) 120 [3]

d) 120 [2]

8 Velocity = 432 km/h on a bearing of 077° . [6]