Further Maths Revision Paper 2

This paper consists of 5 questions covering CP1, CP2, FP1 and FM1.
(AS Further Maths: Q4 and 5)

1

Use L'Hospital's Rule to calculate the

$$\lim_{x\to 0} \frac{1-\cos x}{x^2}$$

2

Draw the polar curve

$$r^2 \sin 2\theta = 2c^2$$

marking key points on your sketch.

3

(a) Prove that

$$\frac{(2n+1)(2n+3)}{(n+1)(n+2)} - \frac{(2n-1)(2n+1)}{(n(n+1)} = \frac{2(2n+1)}{n(n+1)(n+2)}$$

(b) Hence or otherwise show that the sum of the first n terms of the series

$$\frac{3}{1\times 2\times 3} + \frac{5}{2\times 3\times 4} + \cdots$$

is

$$\frac{n(5n+7)}{4(n+1)(n+2)}$$

4

Use the midpoint formula wth $h = 0.1$ to estimate the value at $x = 0.2$ of the particular solution to

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{e^x + y}{y + x^2} \; at (0, 1)$$

correct to 4 decimal places.

Euler's iterative formula

$$y_{n+1} \approx y_n + h \left(\frac{\mathrm{d}y}{\mathrm{d}x} \right)_n$$

Midpoint iterative formula

$$y_{n+1} \approx y_{n-1} + 2h \left(\frac{\mathrm{d}y}{\mathrm{d}x} \right)_n$$

5

(a) Show that $P(5, 5, 3)$ and $Q(-1, 2, -3)$ are on opposite sides of the plane

$$\Pi_1 : 2x - 3y + 6z = 0$$

(b) Find where PQ meets the plane Π_1.

(c) Find the equation of the plane which contains the line PQ and is perpendicular to Π_1