



Note: Answer only ~~four~~^{five} questions

Question 1: (12 Marks)

(a) Determine the area that lies inside $r = 3 + 2 \sin \theta$ and outside $r = 2$. = 24.187

(b) Sketch the graph of each of the following

$$\frac{y^2}{9} - (x + 2)^2 = 1$$

Question 2: (12 Marks)

(a) Determine the equation of the plane that contains the points $P = (1, -2, 0)$, $Q = (3, 1, 4)$ and $R = (0, -1, 2)$.

(b) Write down the equation of the line that passes through the points $(2, -1, 3)$ and $(1, 4, -3)$.
 Write down all three forms of the equation of the line.

Question 3: (12 Marks)

(a) Find all of the first order partial derivative for the following function

$$z = \frac{9u}{u^2 + 5v}$$

(b) Compute each of the following double integrals over the indicated rectangles.

$$\iint_R x^2 y^2 + \cos(\pi x) + \sin(\pi y) dA, \quad R = [-2, -1] \times [0, 1]$$

Question 4: (12 Marks)

(a) Write the following series using summation notation, beginning with $n = 1$: $2 - 4 + 6 - 8 + 10$

(b) Find the tenth term and the n -th term of the following sequence: $1/2, 1, 2, 4, 8, \dots$

Question 5: (12 Marks)

(a) For the vector $\vec{a} = \langle 2, 4 \rangle$ compute $3\vec{a}$, and $-2\vec{a}$. Graph all four vectors on the same axis system. ^{three}

(b) Determine the projection of $\vec{b} = \langle 2, 1, -1 \rangle$ onto $\vec{a} = \langle 1, 0, -2 \rangle$

Question 6: (12 Marks)

(a) Solve $\frac{dy}{dx} = \frac{x^2 + y^2}{xy}$

(b) Solve the following system.

$$\begin{aligned} 3x - y &= 7 \\ 2x + 3y &= 1 \end{aligned}$$

Best of Luck

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