



MATH 122 MATHEMATICAL ANALYSIS-II
SAMPLE MIDTERM EXAM

July 30, 2017



Name: _____

Q1 Find an equation of the plane that contains the three points $P_0(-1, -2, 3)$, $P_1(0, 0, 5)$ and $P_2(-4, -3, 0)$.

Q2 If $u = (-2, 1, 1)$ and $v = (1, 0, 1)$, then find $\|\text{proj}_v u\|$

Q3 Find the parametric equation of the line passing through $(1, 1, -1)$ and which is perpendicular to the plane $2x - y + 3z = 4$ are:

Q4 Find the limit $\lim_{t \rightarrow 0} \mathbf{r}(t) = \lim_{t \rightarrow 0} \left(\frac{e^{2t} - 1}{t} \mathbf{i} + \frac{\sin \pi t}{t} \mathbf{j} + \frac{\sqrt{4+t} - 2}{t} \mathbf{k} \right)$

Q5 Evaluate the integral $\int_0^1 e^{2t} (\mathbf{i} + 2t\mathbf{j} + \ln(t+1)\mathbf{k}) dt$.

Q6 Find the angle between vectors $u = (0, 3, -3)$ and $v = (-2, 2, -1)$.

Q7 Let $\mathbf{r}(t) = \cos t \mathbf{i} + \sin t \mathbf{j} + t \mathbf{k}$ be the position vector.

1. Find the tangent vector $\mathbf{r}'(t)$.

2. Find the length of the curve $\mathbf{r}(t)$ from the point $(1, 0, 0)$ to the point $(0, 1, \frac{\pi}{2})$.

Q8 Find the sum of the following infinite series

1. $\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{36^n}$

2. $\sum_{n=2}^{\infty} \frac{1 - 2^n}{3^n}$

Q9 Show that $x^2 + y^2 + z^2 + 6x - 8y + 24z = 0$ is the equation of a sphere, and find its center and radius.

Q10 Find a power series representation for the $f(x) = \frac{1}{x^2 + 3}$.

Q11 Find the limit if it exists $\lim_{(x,y) \rightarrow (1,2)} \frac{x^2 y^2}{x^2 + y^2}$

Q12 Show that $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y^3}{x^4 + y^6}$ does not exist.

Q13 Find the domain and the range of the function $f(x, y) = \sqrt{4 - x^2 - y^2}$

Q14 Find the radius of convergence and interval of convergence of the series $\sum_{n=1}^{\infty} \frac{x^n}{5^n n}$