King Saud University
Department of Mathematics

1 Mid Term Exam **205-Math** **Summer Semester (1439/1440)**

Question1(1)**.** Find initial point of the vector $\overrightarrow{PQ} = \mathbf{j} - 2\mathbf{k}$ if the terminal point is $Q(-3,-1,2)$

Question2 (3). show that the line $\begin{cases} x = 1 + 2t \\ y = -1 + 6t \\ z = 3 - 8t \end{cases}$ is orthogonal to the plane $x + 3y - 4z + 5 = 0$

Question3 (5). Given that the points $P(6,-3,-7)$, $Q(2,5,13)$ and $R(-3,\lambda,-6)$ form a right angle triangle. (a) Find the value of the real number λ if the right angle is P.

(b) Find the value of the real number λ if the right angle is Q.

(c) Find the value of the real number λ if the right angle is R.

Question4 (3+2+3).

(a) Write and sketch the domain of the function $f(x,y) = \dfrac{\sqrt{1 - x^2 - y^2}}{y} + \dfrac{\sqrt{1 + x^2 + y^2}}{x}$

(b) Find the $\lim\limits_{(x,y)\to(4,0)} \dfrac{\sqrt{x} - 2\sqrt{y+1}}{x - 4y - 4}$ (c) Find the $\lim\limits_{(x,y)\to(0,0)} \dfrac{x^4 \cos y - y^4 \cos x}{x^2 + y^2}$

Question5 (3+3)**.** (a) Find the value of $\dfrac{\partial z}{\partial x} - \dfrac{\partial z}{\partial y}$ at the point $(-1,0,e)$ if the equation

$yz - \ln z = x + y$ defines z as a function of x and y.

(b) show that $\dfrac{\partial f}{\partial x} + \dfrac{\partial f}{\partial y} = 2u\dfrac{\partial f}{\partial u}$ if $f = f(e^{x+y}, e^{x-y})$ and $u = e^{x+y}$.

Question6 (3+3+1)**.** (a) Find the equation of the tangent plane P_1 to the surface S given by the equation $z^2 = y\cos x - \sin x$ at the point $M(0,1,1)$.

(b) find one point Q on the above surface S at which the tangent plane is parallel to the plane $P_2:\ -2x + 2y + 4z + 23 = 0$.

(c) Find the equations of the normal line L to the surface given by the equation: $z^2 = y\cos x - \sin x$ at the point $M(0,1,1)$.