Math 208 Fall 2018 **Exam 1**

Print Your Name Legibly: _____ **Score:** _____

Instructions: You must show supporting work to receive full and partial credits. No textbook, notes, cheat sheets, calculators allowed.

1(12pts) Given three points $P = (1, 0, 2),\ Q = (0, 1, 2),\ R = (1, 1, 1)$, find the following.

(a) The displacement vectors $\vec{PQ}$ and $\vec{PR}$.

(b) The angle between the vectors.

2(12pts) For two vectors $\vec{u} = \langle 1, 0, 1\rangle,\ \vec{v} = \langle 1, -1, 0\rangle$,

(a) Find a vector perpendicular to both vectors.

(b) Find the projection of $\vec{u}$, $\vec{u}_{\text{parallel}}$, in the direction of $\vec{v}$.

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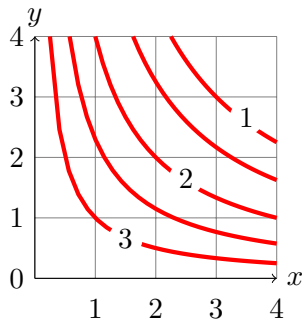
3(10pts) For $\lim_{(x,y)\to(0,0)} \dfrac{x+xy}{2x+y^2}$, find the limit if it exists. If the limit does not exist, explain why not.

4(15pts) (a) For function $w = f(x,y,z) = -y^2 + xy + 2z$, find its directional derivative at $(0,1,-5)$ in the direction of $\vec{i} + 2\vec{j} - 2\vec{k}$.

(b) The figure below shows the level curves of a two-variable function $z = f(x,y)$. At the point $(2,2)$ draw a vector representing the gradient $\nabla f(2,2)$. Explain how you know the direction and the length of the vector.



5(12pts) Find an equation of the tangent plane to the surface defined by the equation $x^3 + y^2 + z = 4$ at point $(1,2,-1)$.

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6(12pts) For function $f(x,y) = xe^{xy}$ find $f_{xy}(x,y)$.

7(12pts) Let $z = f(x,y) = 2x + y$. Find $\dfrac{\partial z}{\partial s}$ if $x = g(s,t)$ with $\dfrac{\partial x}{\partial s} = s + t$ and $y = h(s,t)$ with $\dfrac{\partial y}{\partial s} = 2st$. (Simplification is not needed.)

8(15pts) For function $z = f(x,y) = \frac{x}{1+y}$.

(a) Find the Taylor polynomial of degree 1 for $f(x,y)$ near $(1,0)$.

(b) You are given these values $f_{xx}(1,0) = 0, f_{xy}(1,0) = -1, f_{yy}(1,0) = 2$, find the Taylor polynomial of degree 2 for $f(x,y)$ near $(1,0)$.

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2 Bonus Points: Calculus was discovered in: (a) the 16th century, (b) the 17th century, (c) the 18th century, (d) the 19th century.

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