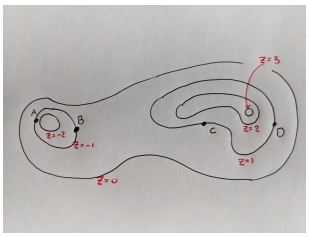
Name:_____

MA 3330: Quiz 3

1. Graph the gradient at the following points A, B, C and D.



2. Compute the gradient of $f(x,y) = x^2 y e^{x^2+y^2-5}$ at $P(1,-2)$ and at $Q(-1,2)$. Interpret the gradients.

3. Compute **using the product rule** and simplify your answer.

   (a) Compute $\frac{\partial}{\partial x}\left[e^{x^2+y^2}\langle x^2, y^3\rangle\right]$.

   (b) Compute $\frac{\partial}{\partial y}\left[e^{x^2+y^2}\langle x^2, y^3\rangle\right]$.

   (c) Compute $\frac{\partial}{\partial t}\left[\langle t^2, t^3\rangle \cdot \langle \cos(t), \sin(t)\rangle\right]$.

   (d) Compute $\frac{\partial}{\partial t}\left[\langle \sin(t), \cos(t), 5\rangle \times \langle \cos(t), \sin(t), 0\ \rangle\right]$.

4. Compute $\frac{\partial f}{\partial t}$ and $\frac{\partial f}{\partial s}$ **using the chain rule** $f(x,y) = \cos(3x + y^2)$, $x = 3 + 2t - s$ and $y = t + 5s$.

5. Using the 2nd derivative test, find and classify the extremma for

$$f(x,y) = x^3 + 2xy - y^2.$$

6. Using the LaGrange Multipliers, find the extremma for $f(x,y,z) = x^2 + y^2 + z^2$, subject to $3x - z + 2y = 3$.

7. Compute the following double integral where R is the region contained within $x = 0$, $x = 3$ $y = -2$ and $y = 2$.

$$\iint_R (e^{2x} y)\, dA$$

8. Compute the following double integral where R is the region contained within $y = x$, $y = 4 - x$ and $x = 0$.

$$\iint_R (x^2 + y)\, dA$$

9. Compute the following double integral where R is the region contained within $x = y^2$ and $x = 4$.

$$\iint_R y e^{x^2}\, dA$$