MATH241-004 Group 2 Questions

Directional Derivatives and Gradient - **Kyle Foster**

1. Find the gradient of the function f(x,y,z)= $2y^3-4(x^2+z^2)y + \tan^{-1}(xy)$ at the point (-1,1,2).

2. Find the derivative of the function f(x,y)= $2x^2 - 4x + y^2 + 2$ from the point (2,3) in the direction of u=4i + 3j.

3. Find the gradient of the function f(x,y)= $3x/(y^2+1)$ at the point (4,1). Also draw the gradient from the level curve through the same point.

Curvature (k) – **Kendrick DuBose**

1.Find the curvature k(t) of the curve r(t) = 4sin(t)i + 4sin(t)j + 2cos(t)k

2.Find the curvature k(t) of the curve r(t)= -sin(t)i - sin(t)j + 2cos(t)k

3.Find the curvature k(t) of the curve r(t) = ti + t^2j + $(\frac{t^2}{2})$k

Tangential and Normal components of acceleration (T and N) – **Mikhail Fomin**

1. Find r, T, N, and B at the given value of t   r(t) = (cos t)i + (sin t)j + tk,   t = 0
2. Find B and T for r(t) = (3 sin t)i + (3 cos t)j + 4tk
3. Find B and T for r(t) = (cos t + t sin t)i + (sin t - t cos t)j + 3k

Length of Curves – **Brian Roessler**

Find the length of the portion of the curves;

1. r(t) = 2tcos(t^2)i + 2tsin(t^2)j + 1/5t^2k   **-2 < t < 2**
2. r(t) = 4t^3i - $t^{3/2}$j + $\frac{1}{2}t^{5/2}$k   **0 < t < 4**
3. r(t) = 6ln($\frac{1}{t}$)i - te^2j + te^tk   **0 < t < e**

Level lines and domains – **Doug Wood**

1. Find and sketch the domain of f(x,y)= $\frac{\sqrt{16-4x^2}}{y^2-16}$
2. Given the function f(x,y)= ln(y-$x^{3/2}$)

a. Sketch the domain of the function
b. Sketch the level lines for f(x,y)= k for k = -1, 0, and 1.

3. Given the function f(x,y)= $\frac{\sqrt{x^2+y-y^2}}{x^2+1}$
   a. Sketch the domain.
   b. Sketch the level lines for f(x,y)=k for k= -1, 0, and 1.

<u>Limits of functions of two variables by simplifying the expression</u> – **Matthew Smith**

1. $\lim_{f(x,y)\to(0,0)}\left(\frac{e^{xy}-1}{y}\right)$
2. $\lim_{f(x,y)\to(9,0)}\left(\frac{4x^3y-40x^2y+36xy}{x-9}\right)$
3. $\lim_{f(x,y)\to(0,0)}\left(\frac{x-y+10\sqrt{x}-10\sqrt{y}}{\sqrt{x}-\sqrt{y}}\right)$

<u>Limits of functions of two variables by approaching from different (and all) directions</u> – **John Cooley**

1. Approach (0,0) through the line y=x and y=0 and determine if the limit exists. $\lim_{f(x,y)\to(0,0)}\left(\frac{4xy}{2x^2+2y^2}\right)$
2. Approach (0,0) through all possible straight and parabolic lines and determine if the limit exists. $\lim_{f(x,y)\to(0,0)}\left(\frac{x^2+y^2}{x^2-y^2}\right)$
3. Approach (0,0) through all possible straight and parabolic lines and determine if the limit exists. $\lim_{f(x,y)\to(0,0)}\left(\frac{3xy^2}{x^2+y^4}\right)$

<u>Limits of functions of two variables by switching to polar coordinates</u> – **John Cooley**

1. $\lim_{f(x,y)\to(0,0)}\left(\frac{x^6}{x^2y^4}\right)$
2. $\lim_{f(x,y)\to(0,0)}\left(\frac{x^3+y^3}{x^2+y^2}\right)$
3. $\lim_{f(x,y)\to(0,0)}\left(\frac{x+y}{x-y}\right)$