Math 241,   Exam 2,   Spring, 2021

Write everything on the blank paper that you brought. There should be nothing on your desk except this exam, the blank paper that you brought, and a pen or pencil. When you are finished, send a picture of your solutions to

kustin@math.sc.edu

ALSO, LEAVE A PHYSICAL COPY OF YOUR SOLUTIONS WITH ME. Fold your solutions in half and write your name on the outside.

The exam is worth 50 points. Each problem is worth 10 points. Please make your work coherent, complete, and correct. Please $\boxed{CIRCLE}$ your answer. Please **CHECK** your answer whenever possible.

(1) Write $2x^2 + 3y^2 - 12x + 24y + 47 = 0$ in the form $a(x-x_0)^2 + b(y-y_0)^2 = c$, for some numbers a, b, c, x_0, and y_0.

(2) Consider the function $f(x,y) = \sqrt{x^2 + y^2 - 1}$.

   (a) Graph and label a few level sets of the form $f(x,y) = c$, where c is a constant.

   (b) Graph $z = f(x,y)$.

(3) Let $f(x,y) = 2x^2y^3 \sin(x^4y^5) + e^{2x} + \ln(5y)$. Find $\frac{\partial f}{\partial x}$.

(4) Find the equation of the plane which contains the points $P = (1,2,3)$, $Q = (4,5,6)$, and $R = (-1,0,2)$. **Check your answer. Make sure it is correct.**

(5) An object travels in the xy-plane. The position vector of the object at time t is $\overrightarrow{r}(t)$, for $0 \leq t$. The acceleration vector of the object at time t is $\overrightarrow{r}''(t) = 6\overrightarrow{i} + 16e^{2t}\overrightarrow{j}$. The initial position vector of the object is $\overrightarrow{r}(0) = 6\overrightarrow{j}$ and the initial velocity vector of the object is $\overrightarrow{r}'(0) = 9\overrightarrow{j}$. Find the y-coordinate of the object when the x-coordinate is 3.