Math 241, Exam 2, Fall, 2017 1:15 class

Write everything on the blank paper provided. **You should KEEP this piece of paper.** If possible: return the problems in order (use as much paper as necessary), use only one side of each piece of paper, and leave 1 square inch in the upper left hand corner for the staple. If you forget some of these requests, don't worry about it – I will still grade your exam.

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.

The solutions will be posted later today.

The exams will be returned on Thrusday.

No Calculators, Cell phones, computers, notes, etc.

(1) Express $\overrightarrow{v} = \overrightarrow{i} + 2\overrightarrow{j}$ as the sum of a vector parallel to $\overrightarrow{b} = 5\overrightarrow{i} + 4\overrightarrow{j}$ plus a vector perpendicular to $\overrightarrow{b}$. **Check your answer. Make sure it is correct.**

(2) Let $f(x,y) = 3x^2 \sin(3y) + 7y \cos(2x)$. Find $\frac{\partial f}{\partial y}$.

(3) Find the point on the plane $x + 2y + 3z = 2$ which is closest to the point $(2, 1, 3)$.

(4) Describe and graph the set of all points in three space which satisfy the equation $x^2 + z^2 = y^2$.

(5) The position vector of an object at time t is $\overrightarrow{r}(t) = \cos(2t)\overrightarrow{i} - \sin(2t)\overrightarrow{j}$.

    (a) Eliminate the parameter and give the path of the object.

    (b) Is the object moving clock-wise or counter clock-wise? (Please explain.)

    (c) What is the speed of the object at time t?

    (d) Draw the velocity vector $\overrightarrow{r}'(\frac{\pi}{4})$ on a picture of the path of the object. Put the tail of the velocity vector on the position of the object at $t = \frac{\pi}{4}$.