Math 241 - Quiz 6- Thursday, December 1

Your name here:

1. Let C be the semi-ellipse $x^2 + 4y^2 = 1$, $x \geq 0$ and consider the vector field

$$F(x, y) = (2, x^2).$$

(a) Find a parametrization $\mathbf{r}(t)$ of C and normal vector $\mathbf{n}(t)$ pointing to the outside of the ellipse. (3 points)

$$\mathbf{r}(t) = (\qquad , \qquad), \qquad \leq t \leq$$

$$\mathbf{n}(t) = (\qquad , \qquad)$$

(b) Find the flux of F across C, moving from inside the ellipse to outside the ellipse. If you couldn't do (a), use $\mathbf{r}(t) = (\cos t, \sin t)$ and $\mathbf{n}(t) = (\cos t, \sin t)$. (3 points)

$$\text{flux} =$$

2. Let $F(x, y) = (x^3, 2x^2y)$.

   (a) Find div F.   (2 points)

$$\boxed{\text{div } F = }$$

   (b) Use the divergence theorem to compute the flux of F across the unit circle (with outward pointing normal vector).