

Math 2415
Paper Homework #5

1. [13.2 & 13.3: Calculus on Curves] Let C be the curve parametrized by

$$\mathbf{r}(t) = \sqrt{2}t\mathbf{i} + e^t\mathbf{j} + e^{-t}\mathbf{k} \quad \text{for } -1 \leq t \leq 1.$$

- (a) Find the velocity vector at $t = 0$.
 - (b) Find the acceleration vector at $t = 0$.
 - (c) Parametrize the tangent line to C at $t = 0$.
 - (d) Calculate the length of C . **Hint:** Show that the formula for the speed of the curve is the square root of a perfect square.
2. [14.1: Functions of Several Variables] Sketch the level curves $f(x, y) = c$ of the following functions $z = f(x, y)$ at the specified values of c .
- (a) $f(x, y) = \frac{1}{1+x^2+4y^2}$, $c = 0.25, 0.5, 1$.
 - (b) $f(x, y) = \exp(x^2 - y^2)$, $c = 1, 2, 3$.
 - (c) $f(x, y) = y - \sin x$, $c = 0, \pm 1, \pm 2$.
 - (d) $f(x, y) = 1 + xy^2$, $c = 0, \pm 1$. **Hint:** Solve $f(x, y) = c$ for x in terms of y and c .