Quiz, Feb 15

Name:

For most accurate results, try doing this without a textbook and spend no more than 15-20 minutes...

0.1. **Vector Valued Functions.** At $t = 0$, the vector valued functions

$$\vec{r}(t) = \langle e^t, t, t^2 \rangle$$
$$\vec{s}(t) = \langle -t + 1, t, t^3 \rangle$$

intersect each other. What is the angle of their intersection?

0.2. **Vector Valued Functions, II.** The helix is drawn out by the function $\vec{r}(t) = \langle \sin t, \cos t, t \rangle$. What is the arclength of the curve over the range $0 \leq t \leq 2\pi$.

Bonus Problem. *Worth no points!* A small rocket is tied to a stick which is one meter long. The other end of the stick is tied to the origin. The rocket travels in a path $\vec{r}(t)$ – which is only confined by the stick. Geometrically justify and mathematically prove the following relation:

$$\vec{r'}(t) \cdot \vec{r}(t) = 0.$$

0.3. **Functions and Contour Plots.** Quick! Match up the following graphs with their contour plots.

- $z = \cos(xy)$
- $z = y^2 + x$
- $z = x^2 - y^2$
- $z = x^2 + y^2$