Quiz, April 11th

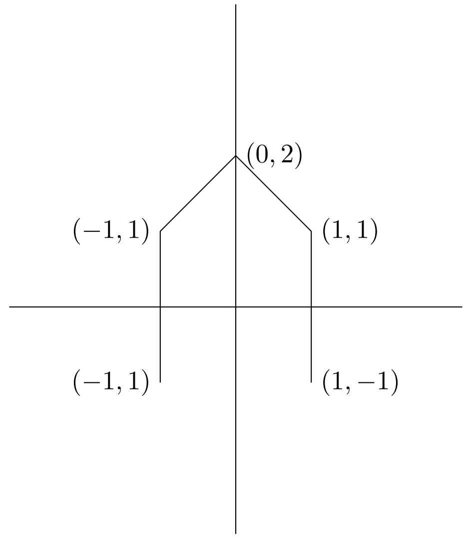
Name:

0.1. **Line Integral I.** Compute the line integral of the vector field $\langle -y, 1\rangle$ over the parametric curve $\langle t, t\rangle$ where $0 \le t \le 1$.
Solution:

$$\int_0^1 \langle -t, 1\rangle \cdot \langle -1, 0\rangle dt = \int_0^1 t dt$$
$$= \frac{1}{2}$$

0.2. **Line Integral II.** Compute the line integral of the vector field $\langle 2xy^3 + 3x, 3(y + x^2y^2)\rangle$ over the curve $\langle \cos t, \sin t\rangle$ as t goes from 0 to π.

0.3. **Line Integral III.** Compute the line integral of the vector field $\langle -y + x^3, x + y \rangle$ over the following curve starting at $(1, -1)$ and ending at $(-1, -1)$. *Hint: You can close up the curve to bound a region by adding in another curve from* $(-1, -1)$ *to* $(1, -1)$.



Bonus Problem, worth no additional Points! A well known mathematical puzzle states the following: If you take a string and tie it around the earth, it would be 40075Km long. In order to take that string, and raise it one meter above the Earth everywhere (imagine it now is a rope-fence 1 meter high, at the equator) you need to add only 6.28 meters to it's length. (This is a exercise using the formula for circumference of a circle.)

However, this puzzle assumes the Earth is a perfect sphere. Show that this result still holds for the actual earth, as long as we assume the earth is convex.