Math 13, Winter 2017

Homework set 6, due Wed Feb 15
Please show your work. No credit is given for solutions without justification.

(1) Consider the vector field $\mathbf{F} = \frac{1}{x^2+y^2+z^2}\langle x, y, z\rangle$. Is $\mathbf{F}$ conservative? Explain why or why not. If it is, find a potential function for $\mathbf{F}$.

(2) Three paths from $(0,0)$ to $(1,2)$ are defined by
  (a) $C_1 : y = 2x$
  (b) $C_2 : y = 2x^2$
  (c) $C_3 : y = 0$ from $(0,0)$ to $(1,0)$ and $x = 1$ from $(1,0)$ to $(1,2)$
  Sketch each path, and along each path find $\int_{C_i} \mathbf{F} \cdot dr$, where $\mathbf{F} = y^2\mathbf{i} + xy\mathbf{j}$ and $i = 1, 2, 3$.

(3) Evaluate the scalar line integral
$$\int_C (3x + xy + z^3)ds$$
where C is parametrized by $r(t) = \langle \cos 4t, \sin 4t, 3t\rangle$ for $0 \le t \le 2\pi$.