Name _____

Homework 22
Section 18.3

1. (5) Determine the potential function, f, for the vector field

$$\vec{F}(x,y,z) = (xye^z + y)\,\vec{i} + \left(\frac{1}{2}x^2e^z + x\right)\vec{j} + \left(\frac{1}{2}x^2ye^z + 3\right)\vec{k}$$

for which $f(2,1,0) = 0$.

2. (7) Use the Fundamental Theorem of Calculus for Line Integrals to compute $\int_C \vec{F} \cdot d\vec{r}$ where

$$\vec{F}(x, y, z) = (2x + yz)\vec{i} + (2y + xz)\vec{j} + (2z + xy)\vec{k}$$

and C is the path from $(1, 3, 6)$ to $(7, 1, 2)$ given by $x(t) = 3t + 1$, $y(t) = 2 + \cos\left(\frac{\pi}{2}t\right)$, $z(t) = 6 - t^2$, for $0 \leq t \leq 2$.

3. (5,3) The path C is a line segment of length 10 in the xy-plane starting at $(1, 2)$. For $f(x, y) = 4x + 3y$, consider $\int_C \text{grad} f \cdot d\vec{r}$.

   (a) Where should the other end of the line segment C be placed in order to maximize the value of the integral? *Hint:* what direction will maximize the value of the integral?

   (b) What is the maximum value of the integral?