

Calc 3 - HW #24

Find a conservative vector field that has the given potential:

$$f(z, y, z) = \sin(x^2 + y^2 + z^2)$$

Find  $\text{div}(\nabla \cdot F)$  and  $\text{curl}(F) = \nabla \times F$

$$F(x, y, z) = \langle x^2z, y^2x, y + 2z \rangle$$

Evaluate  $\int_C (x - y)dx + xdy$  if  $C$  is the graph of  $y^2 = x$  from  $(4, -2)$  to  $(4, 2)$

Find the work done by  $F(x, y, z)$  along the curve  $\langle t, t^2, t^3 \rangle$  from  $(0, 0, 0)$  to  $(2, 4, 8)$ , where  $F(x, y, z) = \langle y, z, x \rangle$

Check which of the following vector fields is not conservative.

$$F(x, y) = \langle 3x^2y + 2, x^3 + 4y^3 \rangle$$

$$F(x, y) = \langle e^x, 3 - e^x \sin(y) \rangle$$

$$F(x, y, z) = \langle 8xz, 1 - 6yz^2, 4x^2 - 9y^2z^2 \rangle$$

Show that the line integrals are independent of the path, and find their value:

$$\int_{(-1, 2)}^{(3, 11)} (y^2 + 2xy)dx + (x^2 + 2xy)dy$$

$$\int_{(-1, 2)}$$

$$\int_{(-2, 1, 3)}$$

$$\int_{(1, 0, 2)} (6xy^3 + 2z^2)dx + (9x^2y^2)dy + (4xz + 1)dz$$