

## Problem Set 20

1. Sketch several representative vectors of the vector field  $\mathbf{F}(x,y,z) = 3y \cdot \hat{\mathbf{j}}$ .

2. Sketch several representative vectors of the vector field  $\mathbf{F}(x,y,z) = y \cdot \hat{\mathbf{i}} - 2x \cdot \hat{\mathbf{j}}$ .

3. Find the conservative vector field for the following potential function:

$$f(x,y) = 5x^2 + 3xy + y^2$$

4. Find the conservative vector field for the following potential function:

$$f(x,y) = \sin(3x) \cdot \cos(4y)$$

5. Show whether or not the following vector field is conservative:

$$\mathbf{F}(x,y) = xy^2 \cdot \hat{\mathbf{i}} + x^2y \cdot \hat{\mathbf{j}}$$

6. Show whether or not the following vector field is conservative:

$$\mathbf{F}(x,y) = \sin(y) \cdot \hat{\mathbf{i}} + x \cdot \cos(y) \cdot \hat{\mathbf{j}}$$

7. Find the potential function for the following vector field:

$$\mathbf{F}(x,y) = 3x^2y^2 \cdot \hat{\mathbf{i}} + 2x^3y \cdot \hat{\mathbf{j}}$$

8. Find the potential function for the following vector field:

$$\mathbf{F}(x,y) = 2xy \cdot \hat{\mathbf{i}} + x^2 \cdot \hat{\mathbf{j}}$$

9. Find the potential function for the following vector field:

$$\mathbf{F}(x,y,z) = xy^2z^2 \cdot \hat{\mathbf{i}} + x^2yz^2 \cdot \hat{\mathbf{j}} + x^2y^2z \cdot \hat{\mathbf{k}}$$

10. Find the potential function for the following vector field:

$$\mathbf{F}(x,y,z) = y^2z^3 \cdot \hat{\mathbf{i}} + 2xyz^3 \cdot \hat{\mathbf{j}} + 3xy^2z^2 \cdot \hat{\mathbf{k}}$$