

Lesson 19

July 18, 2016

Which of the following vector fields are conservative?

- (a) $\vec{F}(x, y) = \langle x, y \rangle$
- (b) $\vec{F}(x, y) = \langle \sin x, \sin y \rangle$
- (c) $\vec{F}(x, y) = \langle e^x \sin y, e^x \cos y \rangle$
- (d) $\vec{F}(x, y) = \langle 3x^2 e^y, x^3 e^y \rangle$
- (e) $\vec{F}(x, y) = \langle y \sin(xy), x \sin(xy) + y \rangle$
- (f) $\vec{F}(x, y) = \langle 2x^2 y^2, xy^3 \rangle$

Answers:

- (a) $\vec{F}(x, y) = \langle x, y \rangle$
- (b) $\vec{F}(x, y) = \langle \sin x, \sin y \rangle$
- (c) $\vec{F}(x, y) = \langle e^x \sin y, e^x \cos y \rangle$
- (d) $\vec{F}(x, y) = \langle 3x^2 e^y, x^3 e^y \rangle$
- (e) $\vec{F}(x, y) = \langle y \sin(xy), x \sin(xy) + y \rangle$
- (f)

are all conservative. Find the potential function f for these functions.

Answers:

- (a) $f(x, y) = x^2/2 + y^2/2 + K$
- (b) $f(x, y) = -\cos x - \cos y + K$
- (c) $f(x, y) = e^x \sin y + K$
- (d) $f(x, y) = x^3 e^y + K$

(e) $f(x, y) = -\cos(xy) + y^2/2 + K$

(f)