

1. Which of the following limits does not exist?

$$A.) \lim_{(x,y) \rightarrow (0,0)} \frac{x^3 + y^3}{x^2 + 2y^2}$$

$$C.) \lim_{(x,y) \rightarrow (0,0)} \frac{3x^3 - x^2y}{\sqrt{x^2 + 2y^2}}$$

$$D.) \lim_{(x,y) \rightarrow (0,0)} \frac{3x^3 + y^3}{x^2y + xy^2}$$

$$F.) \lim_{(x,y) \rightarrow (0,0)} \frac{xy - y^2}{\sqrt{x^3 + y^3}}$$

2. For an unknown function $f(x, y)$ with

$$f_x(x, y) = 2x^2 \cos(x^2 + y^2) + \sin(x^2 + y^2),$$

which of the following *could* be a valid formula for $f_y(x, y)$?

A) $f_y(x, y) = 2y^2 \cos(x^2 + y^2) + \sin(x^2 + y^2)$

B) $f_y(x, y) = 2y^2 \cos(x^2 + y^2) + 2x$

C) $f_y(x, y) = 2y^2 \cos(x^2 + y^2) + 2y$

D) $f_y(x, y) = 2xy \cos(x^2 + y^2) + \sin(x^2 + y^2)$

E) $f_y(x, y) = 2xy \cos(x^2 + y^2) + 2x$

F) $f_y(x, y) = 2xy \cos(x^2 + y^2) + 2y$

3. Find the equation of the tangent plane to the graph of the function

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

at point $(x, y) = (1, 1)$.

A) $z = 11x + 3y - 7$

B) $z = 12x + 2y - 7$

C) $z = 13x + y - 7$

D) $z = 9x + 4y - 6$

E) $z = 10x + 3y - 6$

F) $z = 11x + 2y - 6$