Exam

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

1) If $f(x, y) = 4x^3y^2 + 3x^2y^4 - 7xy^2 + 4x - 3y + 2$, find (a) $f_x(x, y)$ and (b) $f_y(x, y)$. 1) _____

2) If $f(x, y, z) = x^2\sqrt{y^2 + z}$, find (a) $f_x(x, y, z)$, (b) $f_y(x, y, z)$, and (c) $f_z(x, y, z)$. 2) _____

3) If $z = (2x - y)e^{7x^2}$, find (a) $\frac{\partial z}{\partial y}$ and (b) $\left.\frac{\partial z}{\partial x}\right|_{(1, 0)}$. 3) _____

4) If $z = \frac{x^2 + 1}{y}$, find (a) $\frac{\partial z}{\partial x}$ and (b) $\frac{\partial z}{\partial y}$. 4) _____

5) If $z = \frac{e^{xy}}{2x + 3y}$, find $\frac{\partial z}{\partial x}$. 5) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

6) If $f(x, y, z) = x^2yz^2 + xy^2z + xy$, then $f_x(1, 2, 3) =$ 6) _____

A) 50.
B) 55.
C) 48.
D) 36.
E) none of the above

7) If $z = y\sqrt{x^2 + 6y}$, then $\frac{\partial z}{\partial y} =$ 7) _____

A) $\frac{3y}{\sqrt{x^2 + 6y}} + \sqrt{x^2 + 6y}$.
B) $\sqrt{x^2 + 6y}$.
C) $(2x + 6)y\sqrt{x^2 + 6y}$.
D) $\frac{y}{\sqrt{x^2 + 6y}} + \sqrt{x^2 + 6y}$.
E) $\frac{3y}{\sqrt{x^2 + 6y}}$.

8) If $z = e^{x/y}$, then $\frac{\partial z}{\partial y} =$ 8) _____

A) $\frac{y}{x}e^{x/y}$. B) $\frac{x^2}{y}e^{x/y}$. C) $\frac{1}{y}e^{x/y}$. D) $-\frac{x}{y^2}e^{x/y}$. E) $\frac{x}{y}e^{x/y}$.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

9) Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ where $f(x, y) = x^3e^{2y} + y^2 \ln 3x$ and evaluate both derivatives at (1, 0). 9) _____

10) Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ where $f(x, y) = \frac{5xy^2}{(x^3 + y^3)}$. 10) _____

11) If $z = 3x^2y^3 - 4x^5y^2$ find $\frac{\partial z}{\partial y}$ 11) _____

12) If $z = 4xy \ln (3x + 9y)$ find $\frac{\partial z}{\partial x}$ 12) _____

13) If $f(x, y) = e^{-7xy}$ find $f_x(x, y)$ 13) _____

14) A company's production function is given by $P = 40Lk - 3L^2 - 2k^2 + 500$, where P is the total output generated by L units of labor and k units of capital. Determine: 14) _____
(a) the marginal production function with respect to L
(b) the marginal production function with respect to k

15) A company manufactures two products, X and Y, and the joint-cost function for these products is given by $c = 0.002(x + y)^2 + x + 0.25y + 8000$, where c is the total cost of producing x units of X and y units of Y. Determine the marginal cost with respect to x when $x = 450$ and $y = 550$. 15) _____

16) For the joint-cost function $c = 3xy + 5x + 2y + 6000$ (in \$), determine the marginal costs $\frac{\partial c}{\partial c}$ and $\frac{\partial c}{\partial y}$ when $x = 15$ and $y = 20$. 16) _____

17) For the production function $P = 5.4l^{0.741}k^{0.517}$, find the marginal productivity functions $\frac{\partial P}{\partial l}$ and $\frac{\partial P}{\partial k}$. 17) _____

18) For the production function $P = 6l^3 + 5l^2k + 6lk^2 + k^3$, find the marginal productivity functions $\frac{\partial P}{\partial l}$ and $\frac{\partial P}{\partial k}$. 18) _____

1) (a) $12x^2y^2 + 6xy^4 - 7y^2 + 4$ (b) $8x^3y + 12x^2y^3 - 14xy - 3$

2) (a) $2x\sqrt{y^2 + z}$; (b) $\frac{x^2y}{\sqrt{y^2 + z}}$; (c) $\frac{x^2}{2\sqrt{y^2 + z}}$

3) (a) $-e^7x^2$; (b) $30e^7$

4) (a) $\frac{2x}{y}$; (b) $-\frac{(x^2 + 1)}{y^2}$

5) $\frac{e^{xy}(3y^2 + 2xy - 2)}{(2x + 3y)^2}$

6) A

7) A

8) D

9) $3x^2e^{2y} + \frac{y^2}{x}$; $2x^3e^{2y} + 2y\ln 3x$; 3; 2

10) $\frac{5y^5 - 10x^3y^2}{(x^3 + y^3)^2}$; $\frac{10x^4y - 5xy^4}{(x^3 + y^3)^2}$

11) $\frac{\partial z}{\partial y} = 9x^2y^2 - 8x^5y$

12) $\frac{\partial z}{\partial x} = \frac{4xy}{x + 3y} + 4y \ln (3x + 9y)$

13) $f_{x(x, y)} = -7ye^{-7xy}$

14) (a) $40k - 6L$ (b) $40L - 4k$

15) 5

16) $\frac{\partial c}{\partial x}\Big|_{(15,20)} = \$65/unit$; $\frac{\partial c}{\partial y}\Big|_{(15,20)} = \$47/unit$

17) $\frac{\partial P}{\partial l} = 4.0014\frac{k^{0.517}}{l^{0.259}}$; $\frac{\partial P}{\partial k} = 2.7918\frac{l^{0.741}}{k^{0.483}}$

18) $\frac{\partial P}{\partial l} = 18l^2 + 10lk + 6k^2$; $\frac{\partial P}{\partial k} = 5l^2 + 12lk + 3k^2$