$x = \#\ units\ of\ Product\ A$
$y = \#units\ of\ Product\ B$

$$C(x, y) = 25x + 12y$$

Find the total cost when 10 units of Product A and 12 units of Product B are produced.

$$C(10,12) = 25(10) + 12(12)$$
$$250 + 144 = \boxed{394}$$

Let $f(x,y,z) = \frac{1}{2}x - 3y + z^2$. Find $f(6,2,4)$.

$f(6,2,4) = \frac{1}{2}(6) - 3(2) + (4)^2$

$3 - 6 + 16$

$\boxed{13}$

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

Find $f(-2, 4)$. $= (-2)^2 - 2(-2)(4) + (4)^3$

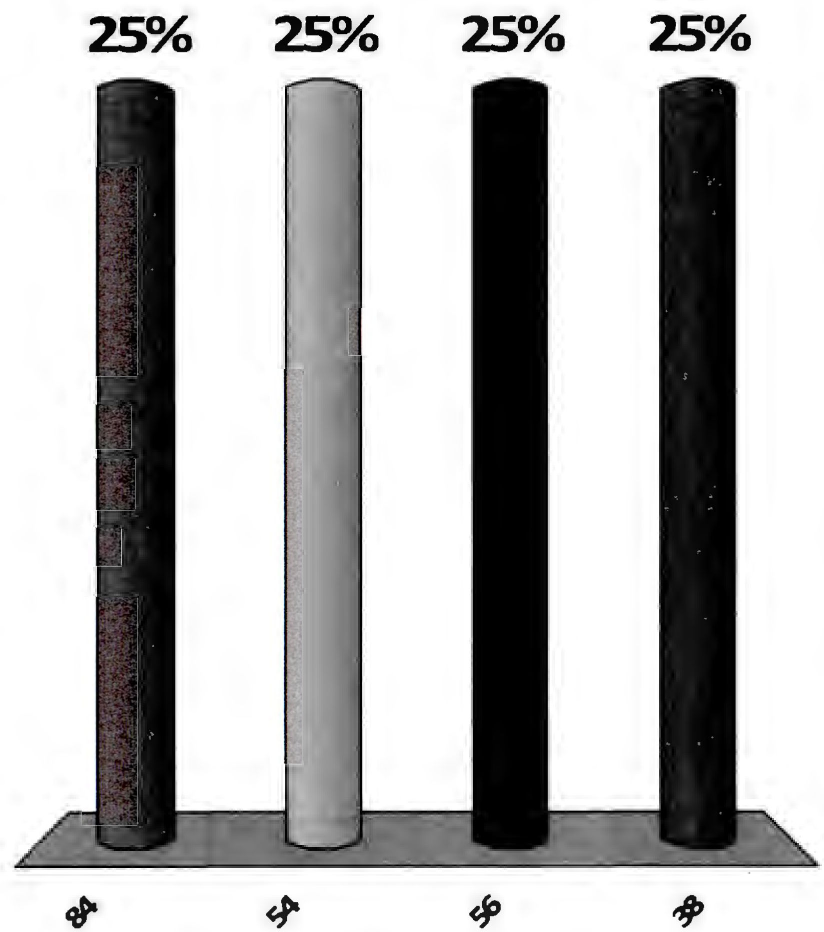
$4 \quad + 16 \quad + 64$

A. 84

B. 54

C. 56

D. 38



Let $f(x,y) = 2x^2y^3 + 6x^5y^4$. Find $f_x(x,y)$ and $f_y(x,y)$.

$f_x(x,y) = 4xy^3 + 30x^4y^4$

$f_y(x,y) = 6x^2y^3 + 24x^5y^3$

Let $g(x,y) = 7x^2y^2 + x^2 + y^2$. Find $g_x(x,y)$ and $g_y(x,y)$.

$g_x(x,y) = 14xy^2 + 2x$

$g_y(x,y) = 14x^2y + 2y$

Let $f(x,y)=e^{3x^2y}$. Find $f_x(x,y)$ and $f_y(x,y)$.

$$f_x(x,y) = e^{3x^2y}(6xy)$$

$$f_y(x,y) = e^{3x^2y}(3x^2)$$

Let $\boldsymbol{f(x,y) = 4x^2 - 9xy + 6y^3}$.

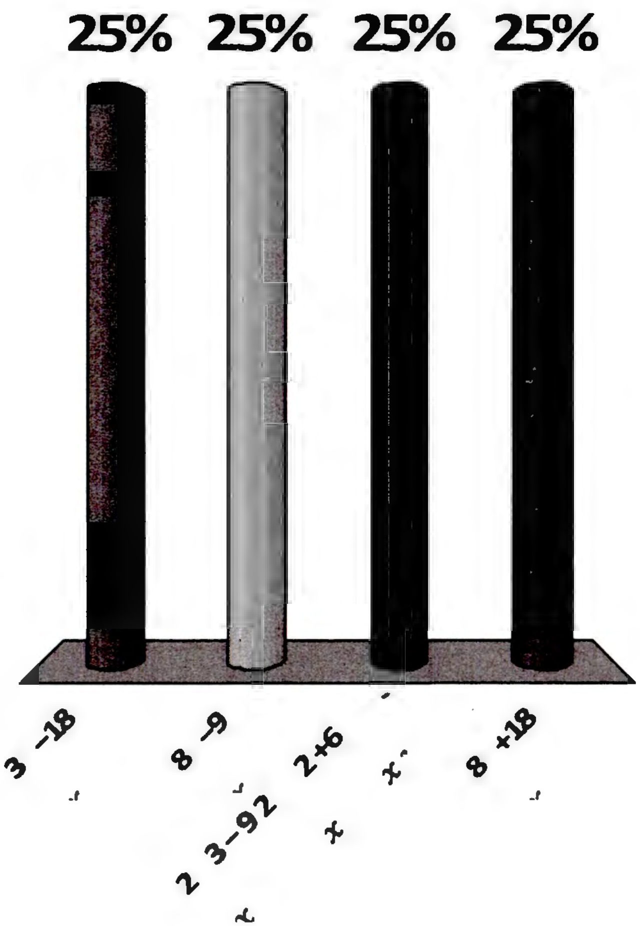
Find $\boldsymbol{f_x(x,y)}$. $= 8x - 9y$

A. $3x - 18y$

B. $8x - 9y$

C. $2x^3 - \frac{9}{2}x^2 + 6xy^3$

D. $8x + 18y$



Find f_{xx} *and* f_{xy}

$$f(x, y) = -4x^3 - 3x^2y^3 + 2y^2$$

$$f_x(x,y) = -12x^2 - 6xy^3 \Rightarrow \boxed{\begin{aligned} f_{xx}(x,y) &= -24x - 6y^3 \\ f_{xy}(x,y) &= -18xy^2 \end{aligned}}$$

Let $f(x,y,z) = 2x^2yz^2 + 3xy^2 - 4yz$.
Find $f_{xz}(x,y,z)$ and $f_{yz}(x,y,z)$.

$f_x(x,y,z) = 4xyz^2 + 3y^2 \Rightarrow \boxed{f_{xz} = 8xyz}$

$f_y(x,y,z) = 2x^2z^2 + 6xy - 4z \Rightarrow \boxed{f_{yz} = 4x^2z - 4}$

Let $\boldsymbol{f(x,y) = 2e^x - 8x^3y^2}$.
Find $\boldsymbol{f_{xx}(x,y)}$.

$f_x(x,y) = 2e^x - 24x^2y^2$
$f_{xx}(x,y) = 2e^x - 48xy^2$

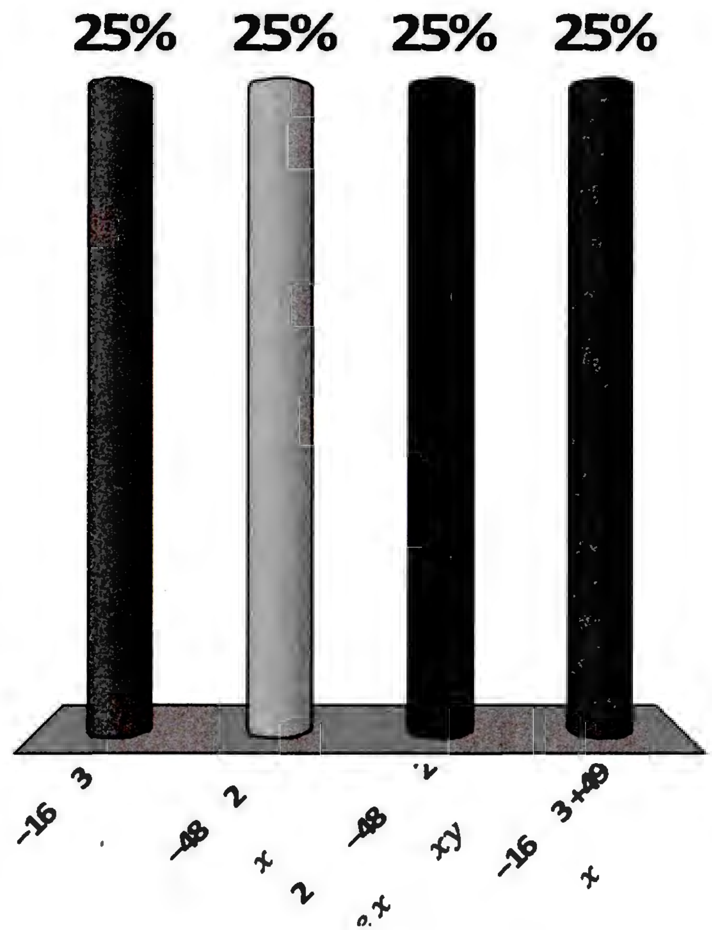
A. $-16x^3$

B. $-48x^2y$

C. $2e^x - 48xy^2$

D. $-16x^3 + 49$

E. $2e^x$



A company that manufactures computers has determined that its production function is given by

$$P(x, y) = 0.1xy^2 \ln(2x + 3y + 2),$$

where x is the size of the labor force (measured in work-hours per week) and y is the amount of capital (measured in units of \$1000) invested. Find the marginal productivity of labor when x=50 and y=20.

(marginal productivity of cost is $P_y(x,y)$)

$$P_x(x,y) = 0.1y^2\left(\ln(2x+3y+2)\right) + 0.1xy^2\left(\frac{2}{2x+3y+2}\right)$$

$$P_x(50,20) = \underbrace{0.1(20)^2}_{40}\ln\big(\underbrace{2(50)}_{100}+\underbrace{3(20)}_{60}+2\big) + \underbrace{0.1(50)(20)^2}_{200}\left(\frac{2}{\underbrace{2(50)+3(20)+2}_{162}}\right)$$

≈ 206 more computers with \$20,000 capital when labor increases from 50 to 51 work-hours per week

Let $p(x,y) = 8x^2 - 16xy + 3y^2 - 32x + 52y - 4$. Find all (x,y) such that $p_x(x,y)$ and $p_y(x,y) = 0$.

$$\left.\begin{aligned} P_x(x,y) &= 16x - 16y - 32 = 0 \\ P_y(x,y) &= -16x + 6y + 52 = 0 \end{aligned}\right\} \text{2 equations, 2 unknowns}$$

add them: $0 - 10y + 20 = 0$

$$y = \frac{-20}{-10} = 2 \implies 16x - 16(2) - 32 = 0$$

$$16x - 64 = 0$$

$$x = 4$$

and

$$-16x + 6(2) + 52 = 0$$

$$-16x + 64 = 0$$

$$x = 4$$

$$\boxed{\text{Solution: } (x,y) = (4,2)}$$