

Worksheet: Partial Derivatives



Q1: Find the first partial derivative of the function $f(x) = \sqrt[3]{x^2 + y - 4}$ with respect to x .

A $\frac{2x + \frac{dy}{dx}}{3\sqrt[3]{(x^2 + y - 4)^2}}$

B $\frac{1}{3\sqrt[3]{(x^2 + y - 4)^2}}$

C $\frac{2x + \frac{dy}{dx}}{\sqrt[3]{(x^2 + y - 4)^2}}$

D $\frac{2x}{3\sqrt[3]{(x^2 + y - 4)^2}}$

E $\frac{2x}{\sqrt[3]{(x^2 + y - 4)^2}}$

Q2: Find the first partial derivative with respect to y of $f(x, y, z) = x^3yz^2 + 2yz$.

A $2x^3yz + 2y$

B $x^3z^2 + 2z$

C $3x^2yz^2$

D $3x^2yz^2 + x^3z^2 + 2x^3yz + 2z + 2y$

Q3: Find the first partial derivative with respect to x of the function $f(x, y) = x + 2y$.

A $2 \frac{dy}{dx}$

B 2

C 1

D $1 + 2 \frac{dy}{dx}$

E 3

Q4: Find the first partial derivative with respect to y of the function $f(x, y) = x + 2y$.

A 2

B 1

C $2 \frac{dy}{dx}$

D $1 + 2 \frac{dy}{dx}$

E 3

Q5: Find the first partial derivative with respect to x of the function

$$f(x, y) = x^2 + y^2.$$

A $2x + 2y$

B $2x$

C $x^2 + 2y$

D $2y$

E x

Q6: Find the first partial derivative with respect to y of the function $f(x, y) =$

$$x^2 - y^2 + 6xy + 4x - 8y + 2.$$

A $2(4x - y - 2)$

B $2\left(x - \frac{dy}{dx}(y - 3x + 4) + 2y + 2\right)$

C $2(x + 3y + 2)$

D $2(3x - y - 4)$

E $2(x + 2y - 2)$

Q7: Find the first partial derivative with respect to x of the function

$$f(x, y) = x^4 + 5xy^3.$$

A $15xy^2$

B $4x^3 + 5y^3$

C $x^4 + 15xy^2$

D $4x^4 + 5xy^3$

E $4x^3 + 15xy^2 + 5y^3$

Q8: Find the first partial derivative with respect to y of $f(x, y) = x^2y - 3y^4$.

A $2xy$

B $x^2 - 12y^3$

C $2xy - 3y^4$

D $x^2y - 12y^4$

E $x^2 + 2xy - 12y^3$

Q9: Find the first partial derivative with respect to x of the function

$$f(x, y) = e^{xy} + xy.$$

A $\left(x \frac{dy}{dx} + y\right)(e^{xy} + 1)$

B $y(e^y + 1)$

C $x(e^x + 1)$

D $x(e^{xy} + 1)$

E $y(e^{xy} + 1)$

Q10: Find the first partial derivative with respect to y of the function

$$f(x, y) = x^4.$$

A $4x^3$

B x^3

C $4x^4$

D $4x^3y$

E 0

Q11: Find the first partial derivative with respect to y of the function

$$f(x, y, z) = \ln(x + 2y + 3z).$$

A $\frac{x}{x + 2y + 3z}$

B $\frac{1}{x + 2y + 3z}$

C $\frac{2}{x + 2y + 3z}$

D $\frac{2y}{x + 2y + 3z}$

E $\frac{3}{x + 2y + 3z}$

Q12: Find the first partial derivative with respect to x of the function

$$f(x, y) = y^2e^{-x}.$$

A $2y^2e^{-x}$

B $2ye^{-x}$

C $-y^2e^{-x} + 2ye^{-x}$

D $-y^2e^{-x}$

E y^2e^{-x}

Q13: Find the first partial derivative of the function $f(x, y) = \frac{e^y}{x + y^2}$ with respect to x .

A $\frac{e^y (x + y^2 - 2y)}{(x + y^2)^2}$

B $-\frac{e^y}{(x + y^2)^2}$

C $\frac{1}{(x + y^2)^2}$

D $\frac{e^y}{(x + y^2)^2}$

E $\frac{e^y (x + y^2 + 2y)}{(x + y^2)^2}$

Q14: Find the first partial derivative of the function $f(x, y, z) = x^{\frac{y}{z}}$ with respect to x .

A $\frac{y}{z} x^{\frac{y}{z}}$

B $\frac{y}{z} x^{\frac{y}{z}-1}$

C $\ln\left(\frac{y}{z}\right) x^{\frac{y}{z}}$

D $x^{\frac{y}{z}-1}$

Q15: Find the first partial derivative of the function $f(x, y) = \frac{xy + 1}{x + y}$ with respect to x .

A $\frac{y^2 - 2xy - 1}{(x + y)^2}$

B $\frac{y^2 - 1}{(x + y)^2}$

C $\frac{y^2 + 2xy - 1}{(x + y)^2}$

D $\frac{x^2 - 1}{(x + y)^2}$

E $\frac{y^2 + 1}{(x + y)^2}$

Q16: Find the first partial derivative of the function $f(x, y) = \frac{x + 1}{y + 1}$ with respect to x .

A $\frac{(y + 1) + \frac{dy}{dx}}{(y + 1)^2}$

B $\frac{1}{y + 1}$

C $\frac{(y + 1) - \frac{dy}{dx}}{(y + 1)^2}$

D $-\frac{x + 1}{(y + 1)^2}$

E $\frac{x + 1}{(y + 1)^2}$

Q17: Find the first partial derivative with respect to y of $f(x, y) = \frac{x}{(x + y)^2}$.

A $-\frac{2x}{(x + y)^3}$

B $\frac{2x}{(x + y)^3}$

C $-\frac{2x}{(x + y)^4}$

D $\frac{y + 3x}{(x + y)^3}$

E $\frac{y - x}{(x + y)^3}$

Q18: Find the first partial derivative with respect to x of the function

$f(x, y) = \sqrt{x^2 + y + 4}$.

A $\frac{x}{\sqrt{x^2 + y + 4}}$

B $\frac{2x}{\sqrt{x^2 + y + 4}}$

C $\frac{1}{2\sqrt{x^2 + y + 4}}$

D $\frac{2x + \frac{dy}{dx}}{\sqrt{x^2 + y + 4}}$

E $\frac{x + \frac{1}{2} \frac{dy}{dx}}{\sqrt{x^2 + y + 4}}$

Q19: Find the first partial derivative with respect to y of $f(x, y, z) = \sqrt{x^4 + y^2 \cos z}$.

A $\frac{2y \cos z}{\sqrt{x^4 + y^2 \cos z}}$

B $-\frac{y \sin z}{\sqrt{x^4 + y^2 \cos z}}$

C $\frac{y \cos z}{\sqrt{x^4 + y^2 \cos z}}$

D $\frac{y \sin z}{\sqrt{x^4 + y^2 \cos z}}$

E $\frac{y \cos z}{\sqrt{2x^4 + y^2 \cos z}}$

Q20: Find, with respect to x , the first partial derivative of $f(x, y, z, t) = \frac{\alpha x + \beta y^2}{\gamma z + \delta t^2}$.

A $\frac{2\delta t (\alpha x + \beta y^2) - \alpha (\gamma z + \delta t^2)}{(\gamma z + \delta t^2)^2}$

B $\frac{\alpha (\gamma z + \delta t^2) - 2\delta t (\alpha x + \beta y^2)}{(\gamma z + \delta t^2)^2}$

C $\frac{\alpha}{\gamma z + \delta t^2}$

D $-\frac{\alpha}{\gamma z + \delta t^2}$

Q21: Find the first partial derivative of the function $f(x, y, z) = y \tan(x + 2z)$ with respect to x .

A $-y \sec^2(x + 2z)$

B $-y \csc^2(x + 2z)$

C $-\sec^2(x + 2z)$

D $y \sec^2(x + 2z)$

E $y \csc^2(x + 2z)$

Q22: Find the first partial derivative of the function $f(x, y, z) = xy^2e^{-xz}$ with respect to x .

A y^2ze^{-xz}

B $2xye^{-xz}$

C $-y^2ze^{-xz}$

D $y^2e^{-xz} - xy^2ze^{-xz}$

E $y^2e^{-xz} + xy^2ze^{-xz}$

Q23: Find the first partial derivative with respect to y of $f(x, y, z) = xy^2e^{-xz}$.

A $2xy^2e^{-xz}$

B xye^{-xz}

C $-x^2y^2e^{-xz}$

D $2xye^{-xz}$

Q24: Find the first partial derivative with respect to y of $f(x, y, z, t) = x^2y \cos\left(\frac{z}{t}\right)$.

A $x^2 \cos\left(\frac{z}{t}\right)$

B $-2x \sin\left(\frac{z}{t}\right)$

C $-x^2 \sin\left(\frac{z}{t}\right)$

D $2x \cos\left(\frac{z}{t}\right)$

Q25: Find the first partial derivative with respect to z of the function

$$f(x, y, z, t) = x^2 y \cos\left(\frac{z}{t}\right).$$

A $-\frac{x^2 y \sin\left(\frac{z}{t}\right)}{t}$

B $\frac{x^2 \sin\left(\frac{z}{t}\right)}{t}$

C $-\frac{x^2 \sin\left(\frac{z}{t}\right)}{t}$

D $-\frac{2xy \sin\left(\frac{z}{t}\right)}{t}$

E $\frac{x^2 y \sin\left(\frac{z}{t}\right)}{t}$