Congratulations! You passed!

Grade received 80% **To pass** 80% or higher

Go to next item

1. In this quiz, you will practice doing partial differentiation, and calculating the total derivative. As you've seen in the videos, partial differentiation involves treating every parameter and variable that you aren't differentiating by as if it were a constant.

1 / 1 point

Keep in mind that it might be faster to eliminate multiple choice options that can't be correct, rather than performing every calculation.

Given $f(x, y) = \pi x^3 + xy^2 + my^4$, with m some parameter, what are the partial derivatives of $f(x, y)$ with respect to x and y?

- ○ $\frac{\partial f}{\partial x} = 3\pi x^3 + y^2$,
  $\frac{\partial f}{\partial y} = 2xy^2 + 4my^4$
- ○ $\frac{\partial f}{\partial x} = 3\pi x^2 + y^2 + my^4$,
  $\frac{\partial f}{\partial y} = 3\pi x^2 + y^2 + my^4$
- ○ $\frac{\partial f}{\partial x} = 3\pi x^3 + y^2 + my^4$,
  $\frac{\partial f}{\partial y} = \pi x^3 + 2xy + 4my^3$
- ◉ $\frac{\partial f}{\partial x} = 3\pi x^2 + y^2$,
  $\frac{\partial f}{\partial y} = 2xy + 4my^3$

Correct
Well done!

2. Given $f(x, y, z) = x^2y + y^2z + z^2x$, what are $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$ and $\frac{\partial f}{\partial z}$?

1 / 1 point

- ○ $\frac{\partial f}{\partial x} = 2xy + y^2z + z^2x$,
  $\frac{\partial f}{\partial y} = x^2 + 2yz + z^2x$
  $\frac{\partial f}{\partial z} = x^2y + y^2 + 2zx$
- ◉ $\frac{\partial f}{\partial x} = 2xy + z^2$,
  $\frac{\partial f}{\partial y} = x^2 + 2yz$
  $\frac{\partial f}{\partial z} = y^2 + 2zx$
- ○ $\frac{\partial f}{\partial x} = xy + z^2$,
  $\frac{\partial f}{\partial y} = x^2 + yz$
  $\frac{\partial f}{\partial z} = y^2 + zx$
- ○ $\frac{\partial f}{\partial x} = 3xyz$,
  $\frac{\partial f}{\partial y} = 3xyz$
  $\frac{\partial f}{\partial z} = 3xyz$

Correct
Well done!

3. Given $f(x, y, z) = e^{2x}\sin(y)z^2 + \cos(z)e^xe^y$, what are $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$ and $\frac{\partial f}{\partial z}$?

0 / 1 point

- ◉ $\frac{\partial f}{\partial x} = 2e^{2x}\sin(y)z^2 + \cos(z)e^xe^y$,
  $\frac{\partial f}{\partial y} = e^{2x}\cos(y)z^2 + \cos(z)e^xe^y$
  $\frac{\partial f}{\partial z} = 2e^{2x}\sin(y)z + \sin(z)e^xe^y$
- ○ $\frac{\partial f}{\partial x} = 4e^{2x}\cos(y)z - \sin(z)e^xe^y$,
  $\frac{\partial f}{\partial y} = 4e^{2x}\cos(y)z - \sin(z)e^xe^y$
  $\frac{\partial f}{\partial z} = 4e^{2x}\cos(y)z - \sin(z)e^xe^y$
- ○ $\frac{\partial f}{\partial x} = 2e^{2x}\sin(y)z^2 + \cos(z)e^xe^y$,
  $\frac{\partial f}{\partial y} = e^{2x}\cos(y)z^2 + \cos(z)e^xe^y$
  $\frac{\partial f}{\partial z} = 2e^{2x}\sin(y)z - \sin(z)e^xe^y$
- ○ $\frac{\partial f}{\partial x} = 2e^{2x}\sin(y)z^2 + \cos(z)e^y$,
  $\frac{\partial f}{\partial y} = e^{2x}\cos(y)z^2 + \cos(z)e^x$
  $\frac{\partial f}{\partial z} = 2e^{2x}\sin(y)z - \sin(z)e^xe^y$

Incorrect
Be careful when differentiating $\cos(z)$ with respect to z.

4. Recall the formula for the total derivative, that is, for $f(x, y)$, $x = x(t)$ and $y = y(t)$, one can calculate $\frac{df}{dt} = \frac{\partial f}{\partial x}\frac{dx}{dt} + \frac{\partial f}{\partial y}\frac{dy}{dt}$.

1 / 1 point

Given that $f(x, y) = \frac{\sqrt{x}}{y}$, $x(t) = t$, and $y(t) = \sin(t)$, calculate the total derivative $\frac{df}{dt}$.

- ○ $\frac{df}{dt} = \frac{1}{2\sqrt{t}\sin(t)} + \frac{\sqrt{t}\cos(t)}{\sin(t)}$
- ◉ $\frac{df}{dt} = \frac{1}{2\sqrt{t}\sin(t)} - \frac{\sqrt{t}\cos(t)}{\sin^2(t)}$
- ○ $\frac{df}{dt} = \frac{1}{2\sqrt{t}\sin(t)} - \frac{\sqrt{t}}{\sin^2(t)}$

- ( ) $\frac{df}{dt} = -\frac{1}{\sqrt{t}\sin(t)} - \frac{\sqrt{t}\cos(t)}{\sin^2(t)}$

Correct
Well done!

5. Recall the formula for the total derivative, that is, for $f(x, y, z), x = x(t), y = y(t)$ and $z = z(t)$, one can calculate $\frac{df}{dt} = \frac{\partial f}{\partial x}\frac{dx}{dt} + \frac{\partial f}{\partial y}\frac{dy}{dt} + \frac{\partial f}{\partial z}\frac{dz}{dt}$.

1 / 1 point

Given that $f(x, y, z) = \cos(x)\sin(y)e^{2z}, x(t) = t + 1, y(t) = t - 1, z(t) = t^2$, calculate the total derivative $\frac{df}{dt}$.

- ( ) $\frac{df}{dt} = [\cos(t+1)\sin(t-1) + \cos(t+1)\cos(t-1) + 4t\cos(t+1)\sin(t-1)]e^{2t^2}$
- ( ) $\frac{df}{dt} = [-\sin(t+1)\sin(t-1) + \cos(t+1)\cos(t-1) + 2\cos(t+1)\sin(t-1)]e^{2t^2}$
- (•) $\frac{df}{dt} = [-\sin(t+1)\sin(t-1) + \cos(t+1)\cos(t-1) + 4t\cos(t+1)\sin(t-1)]e^{2t^2}$
- ( ) $\frac{df}{dt} = [-(t+1)\sin(t+1)\sin(t-1) + (t-1)\cos(t+1)\cos(t-1) + 4t\cos(t+1)\sin(t-1)]e^{2t^2}$

Correct
Well done!