Topic: Derivative of a parametric curve

Question: Find the derivative of the parametric curve.

$$x = t^2$$

$$y = 3t^2 - t$$

Answer choices:

A $\dfrac{t}{t-1}$

B $\dfrac{2t}{6t-1}$

C $\dfrac{t-1}{t}$

D $\dfrac{6t-1}{2t}$

Solution: D

To find the derivative of a parametric curve, we will use the formula

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$$

We'll find

the derivative of y with respect to t, dy/dt, and

the derivative of x with respect to t, dx/dt

and then plug both of them into the formula above. The derivatives of our separate equations are

$$\frac{dy}{dt} = 6t - 1$$

and

$$\frac{dx}{dt} = 2t$$

Plugging these into the formula for the derivative of a parametric curve, we get

$$\frac{dy}{dx} = \frac{6t - 1}{2t}$$

Topic: Derivative of a parametric curve

Question: Find the derivative of the parametric curve.

$$x = 4\cos 4t$$

$$y = t^2 - 4$$

Answer choices:

A $-\dfrac{t}{8\sin 4t}$

B $\dfrac{8\sin 4t}{t}$

C $-\dfrac{8\sin 4t}{t}$

D $\dfrac{t}{8\sin 4t}$

Solution: A

To find the derivative of a parametric curve, we will use the formula

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$$

We'll find

the derivative of y with respect to t, dy/dt, and

the derivative of x with respect to t, dx/dt

and then plug both of them into the formula above. The derivatives of our separate equations are

$$\frac{dy}{dt} = 2t$$

and

$$\frac{dx}{dt} = -16\sin 4t$$

Plugging these into the formula for the derivative of a parametric curve, we get

$$\frac{dy}{dx} = \frac{2t}{-16\sin 4t}$$

$$\frac{dy}{dx} = -\frac{t}{8\sin 4t}$$

Topic: Derivative of a parametric curve

Question: Find the derivative of the parametric curve.

$$x = t \sin 2t$$

$$y = \frac{1}{3} \cos 9t$$

Answer choices:

A $\dfrac{\sin 2t + 2t \cos 2t}{3 \sin 9t}$

B $-\dfrac{3 \sin 9t}{\sin 2t + 2t \cos 2t}$

C $-\dfrac{\sin 2t + 2t \cos 2t}{3 \sin 9t}$

D $\dfrac{3 \sin 9t}{\sin 2t + 2t \cos 2t}$

Solution: B

To find the derivative of a parametric curve, we will use the formula

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$$

We'll find

the derivative of y with respect to t, dy/dt, and

the derivative of x with respect to t, dx/dt

and then plug both of them into the formula above. The derivatives of our separate equations are

$$\frac{dy}{dt} = -3\sin 9t$$

and

$$\frac{dx}{dt} = (1)(\sin 2t) + (t)(2\cos 2t)$$

$$\frac{dx}{dt} = \sin 2t + 2t\cos 2t$$

Plugging these into the formula for the derivative of a parametric curve, we get

$$\frac{dy}{dx} = \frac{-3\sin 9t}{\sin 2t + 2t\cos 2t}$$

$$\frac{dy}{dx} = -\frac{3\sin 9t}{\sin 2t + 2t\cos 2t}$$