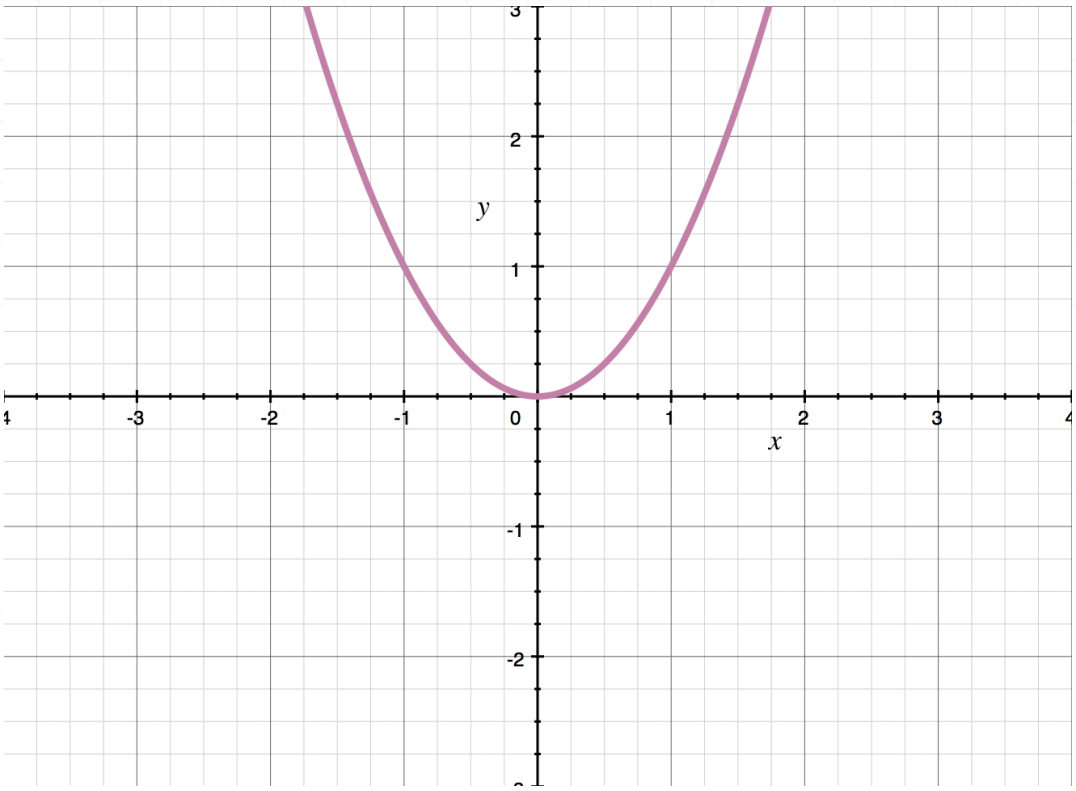
Topic: Projections of the curve

Question: Which vector relates to this sketch of the XY plane projection?



Answer choices:

A $r(t) = \langle t^4, t^3, t^2 \rangle$

B $r(t) = \langle t^2, t, t^3 \rangle$

C $r(t) = \langle t^3, t, t^2 \rangle$

D $r(t) = \langle t, t^2, t^3 \rangle$

Solution: D

The XY plane projection is the sketch of what the vector looks like from the perspective of the xy-plane. To figure out which would be the correct vector, we can take each answer choice, convert it to its parametric form, and then combine the x and y variables. This equation will give us the XY plane projection.

Changing answer choice A, $r(t) = \langle t^4, t^3, t^2 \rangle$, to its parametric form for the x and y variables gives

$$x = t^4$$

$$y = t^3$$

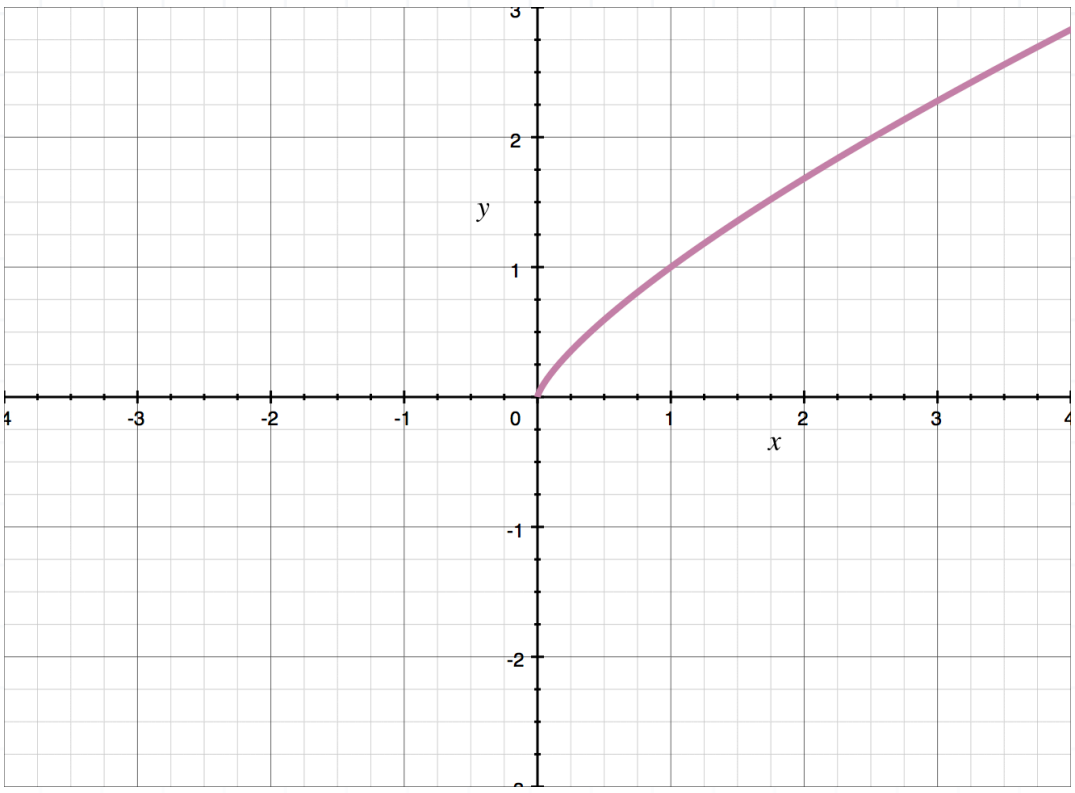
Solving $x = t^4$ for t gives

$$t = x^{\frac{1}{4}}$$

Plugging $t = x^{\frac{1}{4}}$ into $y = t^3$ gives

$$y = x^{\frac{3}{4}}$$

A sketch of this curve is



This is not the given sketch for the XY plane projection, so answer choice A is not the right answer.

Changing answer choice B, $r(t) = \langle t^2, t, t^3 \rangle$, to its parametric form for the x and y variables gives

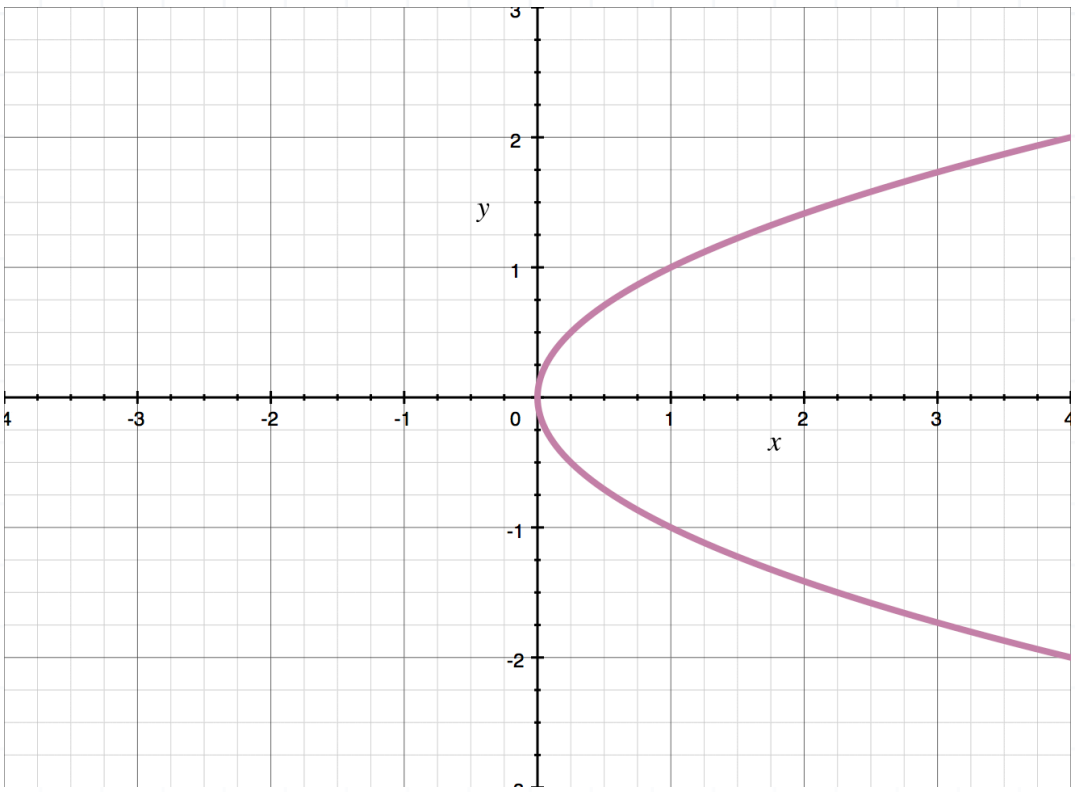
$$x = t^2$$

$$y = t$$

Plugging $y = t$ into $x = t^2$ gives

$$x = y^2$$

A sketch of this curve is



This is not the given sketch for the XY plane projection, so answer choice B is not the right answer.

Changing answer choice C, $r(t) = \langle t^3, t, t^2 \rangle$, to its parametric form for the x and y variables gives

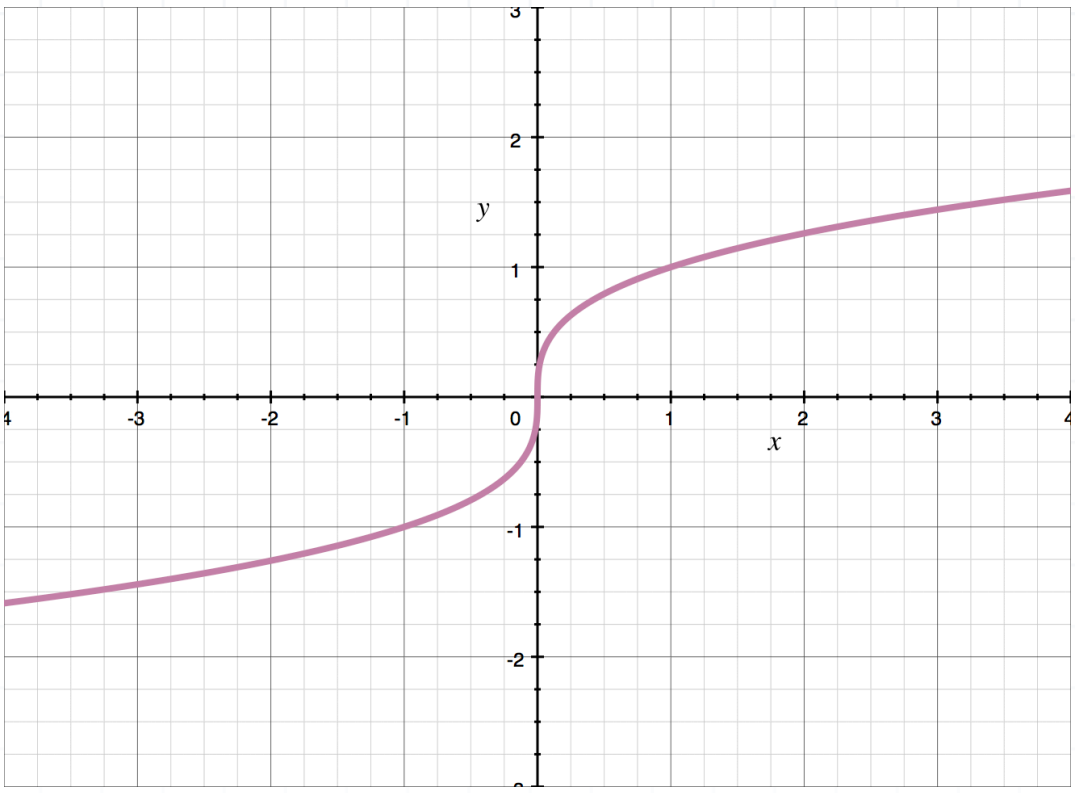
$$x = t^3$$

$$y = t$$

Plugging $y = t$ into $x = t^3$ gives

$$x = y^3$$

A sketch of this curve is



This is not the given sketch for the XY plane projection, so answer choice C is not the right answer.

Changing answer choice D, $r(t) = \langle t, t^2, t^3 \rangle$, to its parametric form for the x and y variables gives

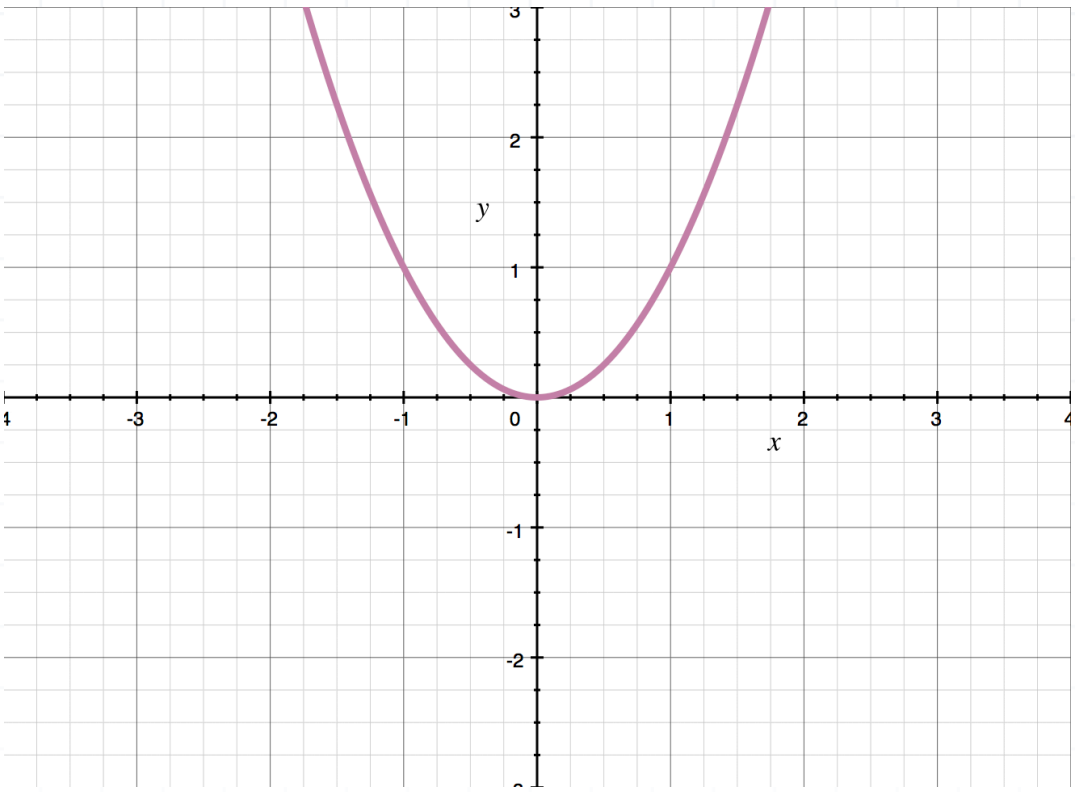
$$x = t$$

$$y = t^2$$

Plugging $x = t$ into $y = t^2$ gives

$$y = x^2$$

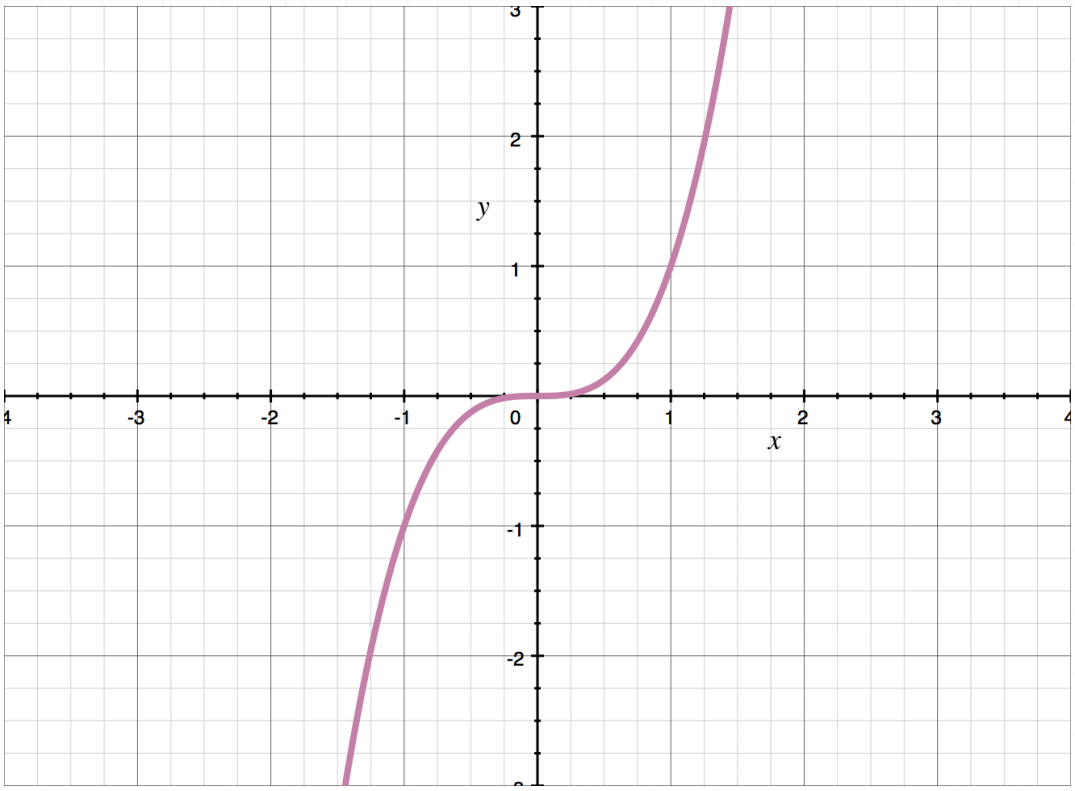
A sketch of this curve is



This is the given sketch for the XY plane projection, so answer choice D is the right answer.

Topic: Projections of the curve

Question: Which vector relates to this sketch of the XY plane projection?



Answer choices:

A $r(t) = \langle 2t^3, t^2, \sin t^2 \rangle$

B $r(t) = \langle t^3, t^2, \cos t^2 \rangle$

C $r(t) = \langle t, t^3, \cos t^2 \rangle$

D $r(t) = \langle t, 2t^3, \sin t^2 \rangle$

Solution: C

The XY plane projection is the sketch of what the vector looks like from the perspective of the xy-plane. To figure out which would be the correct vector, we can take each answer choice, convert it to its parametric form, and then combine the x and y variables. This equation will give us the XY plane projection.

Changing answer choice A, $r(t) = \langle 2t^3, t^2, \sin t^2 \rangle$, to its parametric form for the x and y variables gives

$$x = 2t^3$$

$$y = t^2$$

Solving $y = t^2$ for t gives

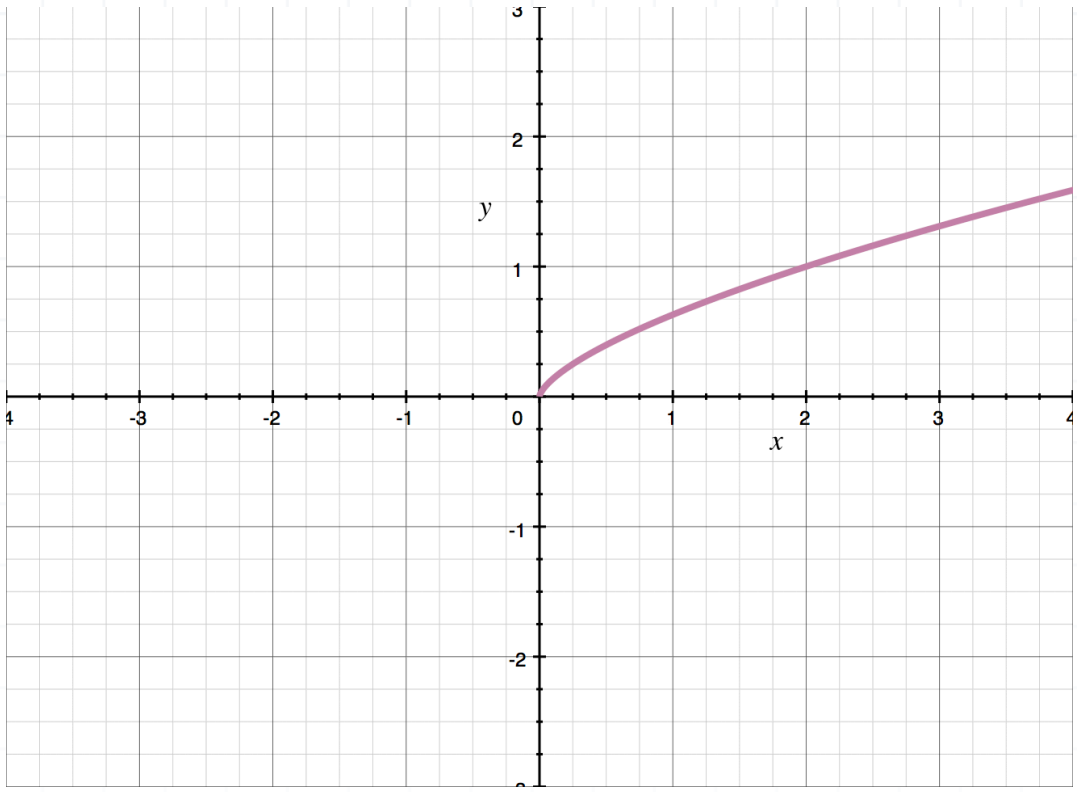
$$t = y^{\frac{1}{2}}$$

Plugging $t = y^{\frac{1}{2}}$ into $x = 2t^3$ gives

$$x = 2\left(y^{\frac{1}{2}}\right)^3$$

$$x = 2y^{\frac{3}{2}}$$

A sketch of this curve is



This is not the given sketch for the XY plane projection, so answer choice A is not the right answer.

Changing answer choice B, $r(t) = \langle t^3, t^2, \cos t^2 \rangle$, to its parametric form for the x and y variables gives

$$x = t^3$$

$$y = t^2$$

Solving $y = t^2$ for t gives

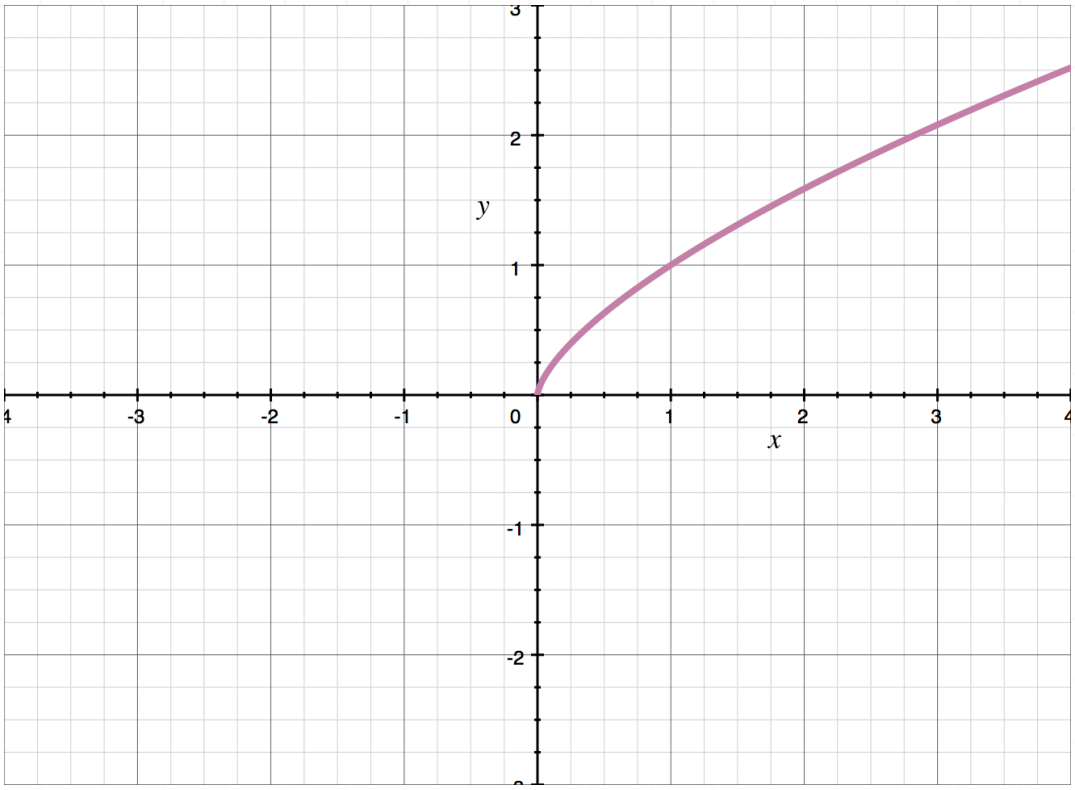
$$t = y^{\frac{1}{2}}$$

Plugging $t = y^{\frac{1}{2}}$ into $x = t^3$ gives

$$x = \left(y^{\frac{1}{2}}\right)^3$$

$$x = y^{\frac{3}{2}}$$

A sketch of this curve is similar to the last curve, like



This is not the given sketch for the XY plane projection, so answer choice B is not the right answer.

Changing answer choice C, $r(t) = \langle t, t^3, \cos t^2 \rangle$, to its parametric form for the x and y variables gives

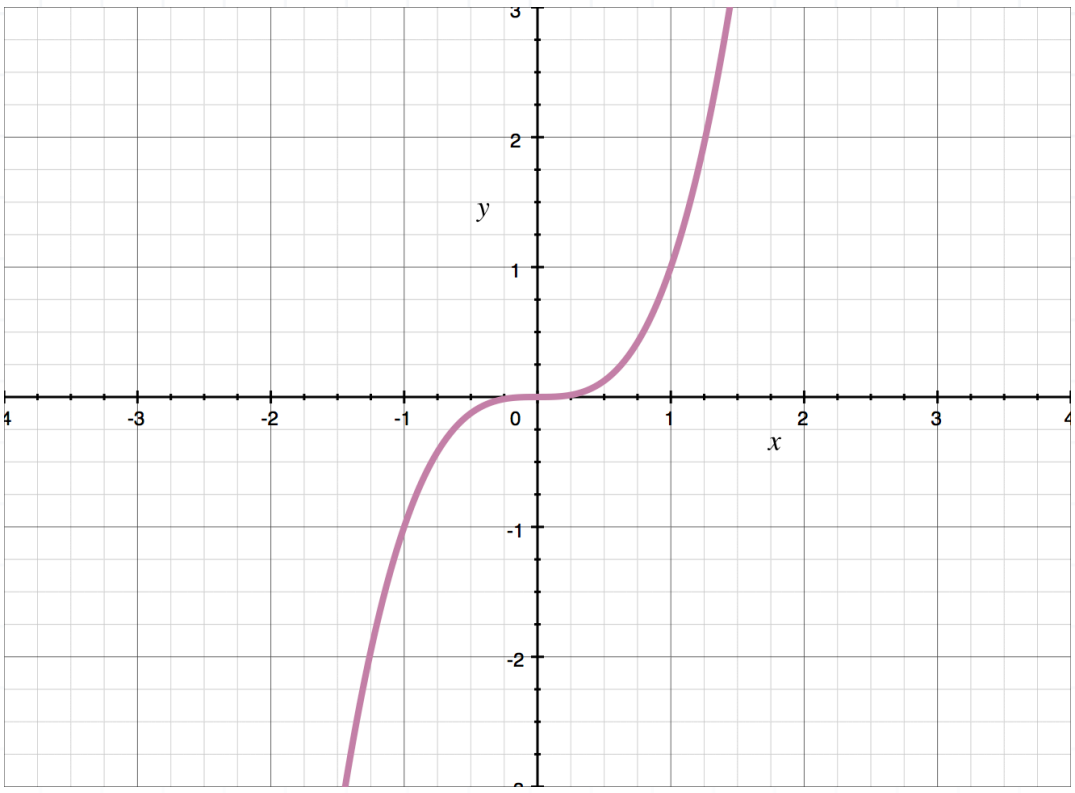
$$x = t$$

$$y = t^3$$

Plugging $x = t$ into $y = t^3$ gives

$$y = x^3$$

A sketch of this curve is



This is the given sketch for the XY plane projection, so answer choice C is the right answer.

Changing answer choice D, $r(t) = \langle t, 2t^3, \sin t^2 \rangle$, to its parametric form for the x and y variables gives

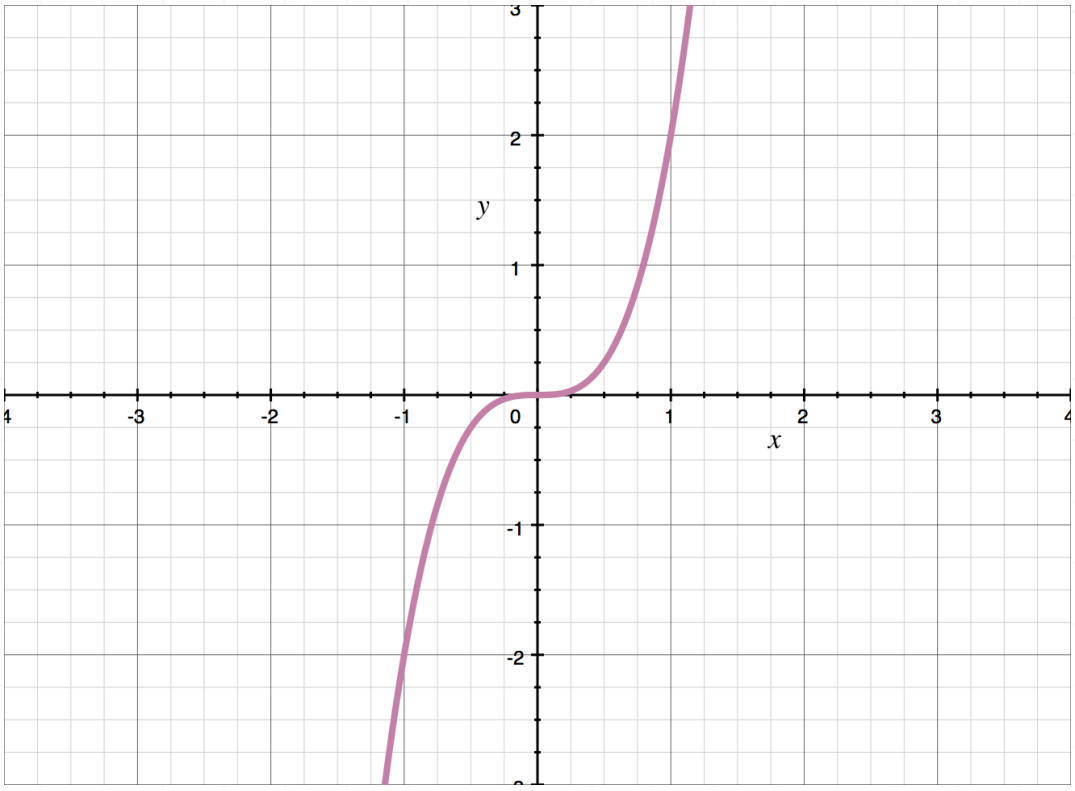
$$x = t$$

$$y = 2t^3$$

Plugging $x = t$ into $y = 2t^3$ gives

$$y = 2x^3$$

A sketch of this curve is



This is not the given sketch for the XY plane projection, so answer choice D is not the right answer.

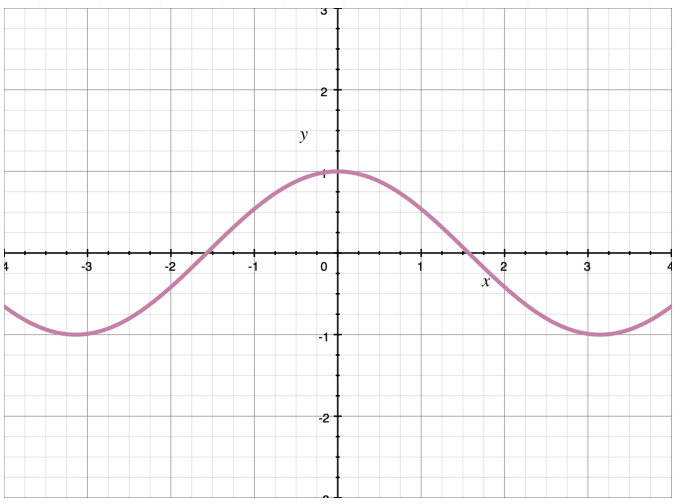
Topic: Projections of the curve

Question: Which is the YZ plane projection of the vector?

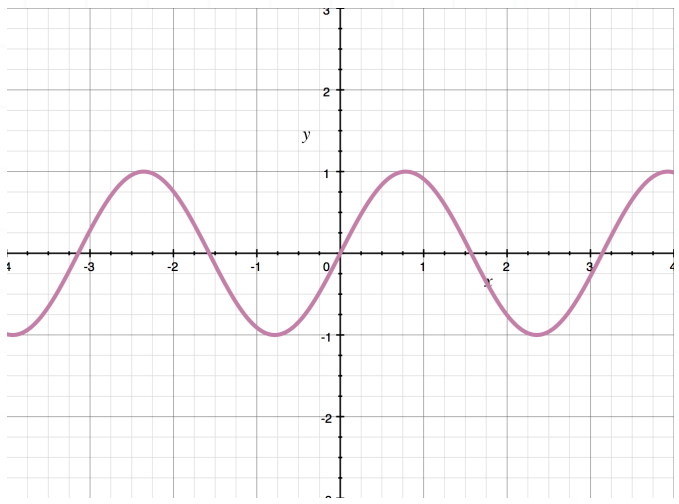
$$r(t) = \langle 3\ln t, t, \sin t \rangle$$

Answer choices:

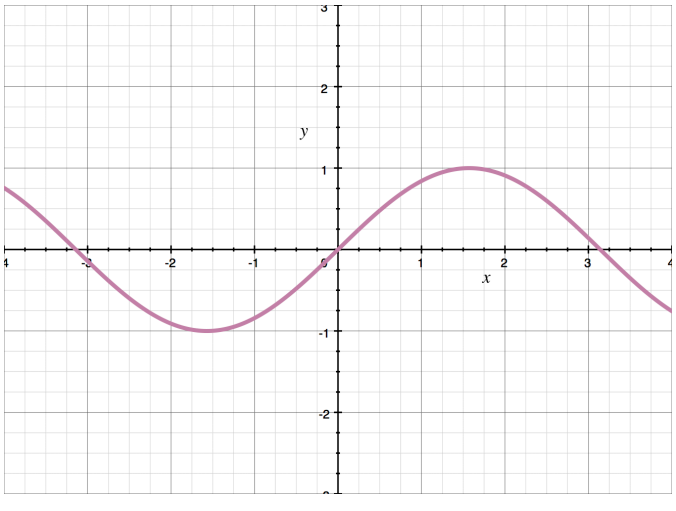
A



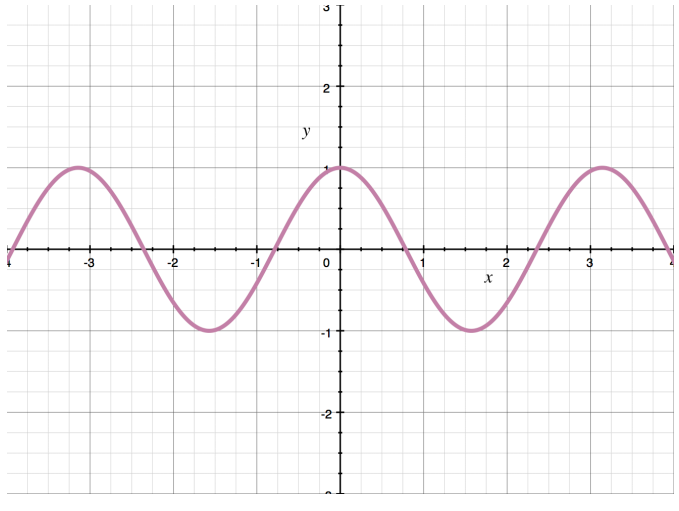
B



C



D



Solution: C

The YZ plane projection is the sketch of what the vector looks like from the perspective of the yz-plane.

We'll change $r(t) = \langle 3\ln t, t, \sin t \rangle$ to its parametric form for the y and z variables.

$$y = t$$

$$z = \sin t$$

Then we'll substitute $y = t$ into $z = \sin t$.

$$z = \sin y$$

A sketch of $z = \sin y$ looks like