

□ 18/18

Math 220-X8

Quiz 2 (Lesson 9)

Name Solutions

[2 pts each] Match the parametrization with its graph. Write the letter in the blank.

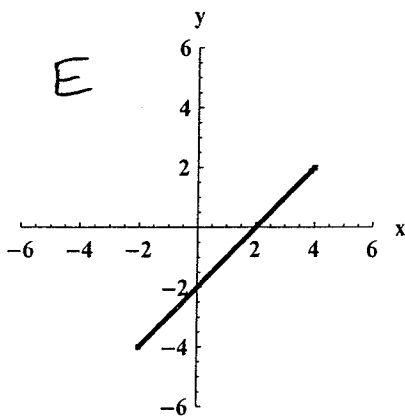
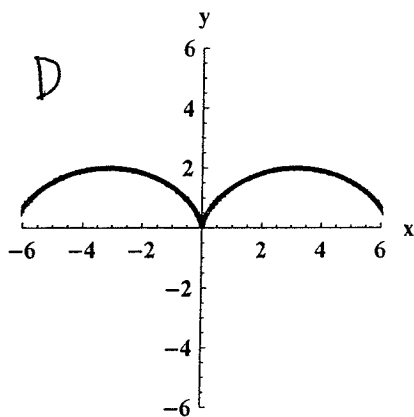
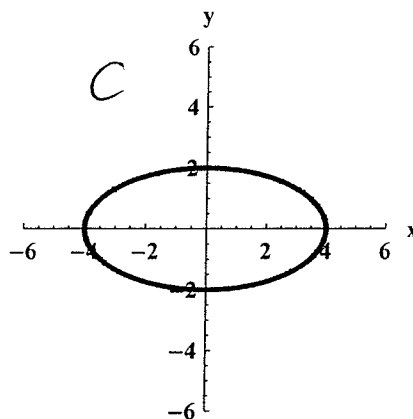
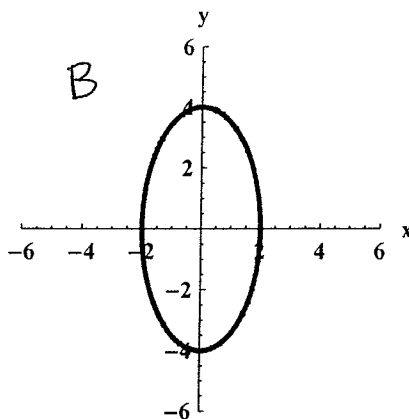
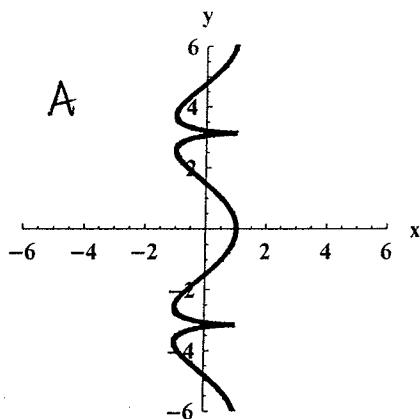
1.) $x[t] = \cos[2t]$ A
 $y[t] = t + \sin[t]$
 $-2\pi \leq t \leq 2\pi$

2.) $x[t] = t - \sin[t]$ D
 $y[t] = 1 - \cos[t]$
 $-2\pi \leq t \leq 2\pi$

3.) $x[t] = 2\cos[t]$ B
 $y[t] = 4\sin[t]$
 $0 \leq t \leq 2\pi$

4.) $x[t] = 6t - 2$ E
 $y[t] = 6t - 4$
 $0 \leq t \leq 1$

5.) $x[t] = 4\cos[t]$ C
 $y[t] = 2\sin[t]$
 $0 \leq t \leq 2\pi$



$$\begin{aligned} &\rightarrow (1-t)(-2, -4) + t(4, 2) \\ &= (-2+2t, -4+4t) + (4t, 2t) \\ &= (-2+6t, -4+6t) \end{aligned}$$

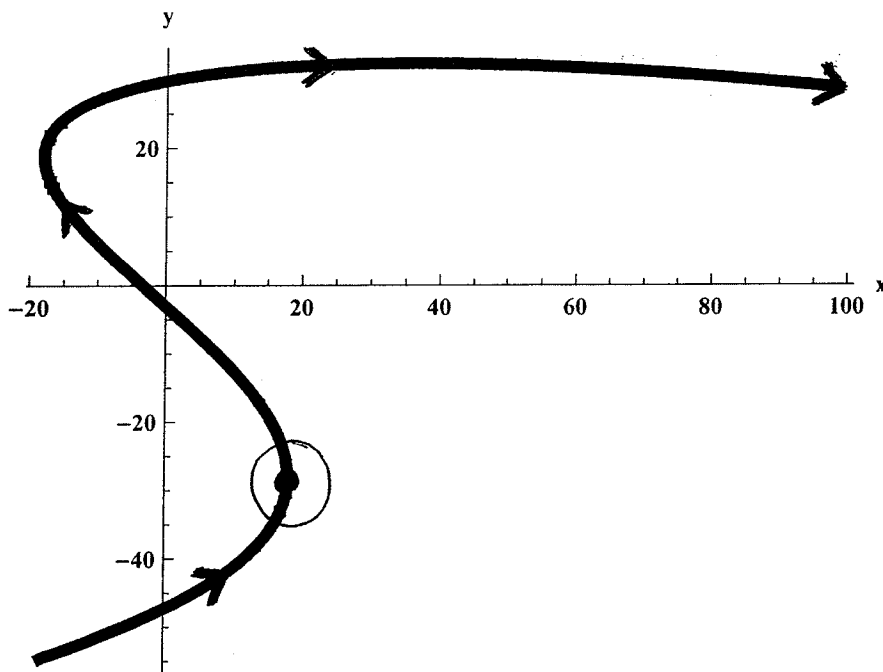
[2 pts each] Derivatives of a Parametric Curve.

Here is a parametrization of a curve and a plot of it:

$$x[t] = \frac{1}{3}t^3 - 9t$$

$$y[t] = 9t - 3e^{\frac{1}{3}t}$$

$$-7 \leq t \leq 7$$



6. Calculate $\frac{dx}{dt}$.

$$\frac{1}{3}3t^2 - 9$$

$$= t^2 - 9.$$

7. Calculate $\frac{dy}{dt}$.

$$9 - 3e^{\frac{1}{3}t} \cdot \left(\frac{1}{3}t\right)'$$

$$= 9 - e^{\frac{1}{3}t}.$$

8. Calculate $\frac{dy}{dx}$.

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{9 - e^{\frac{1}{3}t}}{t^2 - 9}.$$

$$x(-3) = \frac{1}{3}(-27) - 9(-3)$$

$$= -9 + 27 = 18$$

$$y(-3) = 9(-3) - 3e^{\frac{1}{3}(-3)}$$

$$= -27 - 3e^{-1}$$

9. Determine the coordinates (x, y) of the point shown on the graph above.

$$x'(t) = 0$$

$$t^2 - 9 = 0 \rightarrow t = \pm 3$$

The direction arrows tell us the point is $t = -3$, not positive 3.

$$\left(18, -27 - \frac{3}{e}\right)$$

It has vertical tangent!