

PRACTICE PROBLEM SET 13

Now try these problems. The answers are in Chapter 21.

1. Find the velocity and acceleration of a particle whose position function is $x(t) = t^3 - 9t^2 + 24t$, $t > 0$.

2. Find the velocity and acceleration of a particle whose position function is $x(t) = \sin(2t) + \cos(t)$.

3. If the position function of a particle is $x(t) = \frac{t^2 + 9}{t}$, $t > 0$, find when the particle is changing direction.

4. If the position function of a particle is $x(t) = \sin\left(\frac{t}{2}\right)$, $0 < t < 4\pi$, find when the particle is changing direction.

5. If the position function of a particle is $x(t) = 3t^2 + 2t + 4$, $t > 0$, find the distance that the particle travels from $t = 2$ to $t = 5$.

6. If the position function of a particle is $x(t) = t^2 + 8t$, $t > 0$, find the distance that the particle travels from $t = 0$ to $t = 4$.

7. If the position function of a particle is $x(t) = 2\sin^2 t + 2\cos^2 t$, $t > 0$, find the velocity and acceleration of the particle.

8. If the position function of a particle is $x(t) = t^3 + 8t^2 - 2t + 4$, $t > 0$, find when the particle is changing direction.

9. If the position function of a particle is $x(t) = 2t^3 - 6t^2 + 12t - 18$, $t > 0$, find when the particle is changing direction.

10. If the position function of a particle is $x(t) = \sin^2 2t$, $t > 0$, find the distance that the particle travels from $t = 0$ to $t = 2$.

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10. If the position function of a particle is $x(t) = \sin^2 2t$, $t > 0$, find the distance that the particle travels from $t = 0$ to $t = 2$.

$$3) (t^2 + 1) - t(2t) = \frac{-t^2 + 1}{t^2 + 1} = \frac{-t^2 + 1}{t^2 + 1} = \frac{-t^2 + 1}{t^2 + 1}$$

$$t = 3$$

$$4) x(t) = \frac{1}{2} \cos\left(\frac{t}{2}\right)$$

$$\frac{t}{2} = \frac{\pi}{2} \Rightarrow t = \pi$$

$$t = \pi + 3\pi$$

1. $a = 6t - 18$

2. $v = 2\cos(2t) - \sin t$

$a = -4 \sin(2t) - \cos t$

3. $t = 3$

4. $t = \pi, 3\pi$

5. 69

6. 48

7. $v = 0$

8. $3t^2 + 12t - 2$

9. $6t^2 - 12t + 12$

10. $2t^2 + 4t - 8$

As with trigonometric functions you've studied: Prerequisite Mathematics. All of what you need to know about