

Find an equation of the tangent to the curve at the point corresponding to the given value of the parameter.

1. $x = t^4 + 1, y = t^3 + t$ $t = -1$ 2. $x = \cos \theta, y = \sin \theta + \cos 2\theta$ $\theta = 0$

3. $x = e^t, y = (t-1)^2$ $(1,1)$

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. For which values of t is the curve concave upward?

4. $x = 4 + t^2, y = t^2 + t^3$

5. $x = t - e^t, y = t + e^{-t}$

6. $x = 2\sin t, y = 3\cos t$ $0 < t < 2\pi$

Find the points on the curve where the tangent is horizontal or vertical.

7. $x = 10 - t^2, y = t^3 - 12t$

8. $x = 2\cos \theta, y = \sin 2\theta$

Find the length of the curve.

9. $x = t - t^2, y = \frac{4}{3}t^{3/2}$ $1 \leq t \leq 2$

10. $x = t + \cos t, y = t - \sin t$ $0 \leq t \leq 2\pi$

11. $x = 1 + 3t^2, y = 4 + 2t^3$ $0 \leq t \leq 1$

12. $x = \frac{t}{1+t}, y = \ln(1+t)$ $0 \leq t \leq 2$

Find the velocity, acceleration and speed of a particle with given position function and given time, t .

13. $r(t) = \langle t^2 - 1, t \rangle$ at $t = 1$

14. $r(t) = \langle 2 - t, 4\sqrt{t} \rangle$ at $t = 1$

Evaluate the Limits

15. $\lim_{t \rightarrow 0^+} \langle \cos t, \sin t \rangle =$

16. $\lim_{t \rightarrow 0^+} \left\langle \frac{e^t - 1}{t}, \frac{3}{1+t} \right\rangle =$

Find the distance traveled on the curve

18. $r(t) = \langle 2\sin t, 2\cos t \rangle$ $-10 \leq t \leq 10$

Given the velocity vector and the starting position find the particles position at time, $t = 4$

19. $v(t) = \langle t^2, t \rangle$ positon at time $t = 0$ is $(4, -1)$

19. $v(t) = \langle \sin t, \cos t \rangle$ positon at time $t = 0$ is $(-3, 2)$