Find $\frac{dy}{dx}$.

1) $x = t - t^3, \quad y = 2 - 5t$

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

2) $x = t^4 + 1, \quad y = t^3 + t, \quad t = -1$

3) $x = e^{\sqrt{t}}, \quad y = t - \ln t^2, \quad t = 1$

4) $x = \cos\theta + \sin 2\theta, \quad y = \sin\theta + \cos 2\theta, \quad t = 0$

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

5) $x = 4 + t^2, \quad y = t^2 + t^3$

6) $x = t - e^t, \quad y = t + e^{-t}$

7) $x = 2\sin t, \quad y = 3\cos t, \quad 0 < t < 2\pi$

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

8) $x = 2t^3 + 3t^2 - 12t, \quad y = 2t^3 + 3t^2 + 1$

9) $x = 2\cos\theta, \quad y = \sin 2\theta$

10) At what points on the curve $x = t^3 + 4t$, $y = 6t^2$ is the tangent parallel to the line with equations $x = -7t$, $y = 12t - 5$?

11) Use the parametric equations of an ellipse, $x = a\cos\theta$, $y = b\sin\theta$, $0 \le \theta \le 2\pi$, to find the area that it encloses.

12) Find the area bounded by the curve $x = \cos t$, $y = e^t$, $0 \le t \le 2\pi$, and the lines $y = 1$ and $x = 0$.

Set up, but do not evaluate, an integral that represents the length of the curve.

13) $x = t - t^2, \quad y = \frac{4}{3}t^{3/2}, \quad 1 \le t \le 2$

14) $x = \ln t, \quad y = \sqrt{t+1}, \quad 1 \le t \le 5$

Find the length of the curve.

15) $x = 1 + 3t^2, \quad y = 4 + 2t^3, \quad 0 \le t \le 1$

16) $x = e^t \cos t, \quad y = e^t \sin t, \quad 0 \le t \le \pi$

17) $x = e^t - t, \quad y = 4e^{t/2}, \quad -8 \le t \le 3$