Q: Find an eq^n for the line tangent to the curve at the point defined by the given value of t. Also find the value of $\frac{d^2y}{dx^2}$ at this point.

1) $x = 2\cos t$, $y = 2\sin t$, $t = \pi/4$

2) $x = \sin 2\pi t$, $y = \cos 2\pi t$, $t = -1/6$

3) $x = 4\sin t$, $y = 2\cos t$, $t = \pi/4$.

4) $x = \cos t$, $y = \sqrt{3}\cos t$, $t = 2\pi/3$

5) $x = t$, $y = \sqrt{t}$, $t = 1/4$.

6) $x = \sec^2 t - 1$, $y = \tan t$, $t = -\pi/4$

7) $x = \sec t$, $y = \tan t$, $t = \pi/6$

8) $x = -\sqrt{t+1}$, $y = \sqrt{3t}$, $t = 3$

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

10) $x = 1/t$, $y = -2 + \ln t$, $t = 1$

11) $x = t - \sin t$, $y = 1 - \cos t$, $t = \pi/3$

12) $x = \cos t$, $y = 1 + \sin t$, $t = \pi/2$

13) $x = \frac{1}{t+1}$, $y = \frac{t}{t-1}$, $t = 2$

14) $x = 1 + e^t$, $y = 1 - e^t$, $t = 0$

15) $x = 2\cos t$, $y = 3\sin t$, $t = \pi/2$

16) $x = \sin 2\pi t$, $y = \cos 4\pi t$, $t = 2$.

17) $x = 4\sin t$, $y = 6\cos t$, $t = \pi/6$

18) $x = 2\cos t$, $y = \sqrt{2}\cos t$, $t = 2\pi/3$

19) $x = 2\cos t$, $y = 4\sin t$, $t = \pi/3$

20) $x = t^2$, $y = \sqrt{t}$, $t = 2$

21) $x = 3t^3 + t$, $y = t^2$, $t = 1$

22) $x = 5\sin t$, $y = 2\cos t$, $t = \pi/4$

23) $x = 3t^4 + t^2$, $y = t^3$, $t = 2$

24) $x = 3t^2$, $y = t^4$, $t = 1$

25) $x = \cos t$, $y = 2 + \sin t$, $t = \pi/2$

26) $x = 2\cos t$, $y = 3\sin t$, $t = \pi/4$

27) $x = t$, $y = t^4$, $t = 1$

28) $x = 2$, $y = 2t$, $t = 0$

Q: Find the area;

29) enclosed by the y-axis and the curve $x = t - t^2$, $y = 1 + e^{-t}$.

30) enclosed by the ellipse $x = a\cos t$, $y = b\sin t$, $0 \le t \le 2\pi$.

Q: Find the area under $y = x^3$ over $[0, 1]$ using the following

31) $x = t^2$, $y = t^6$

32) $x = t^3$, $y = t^9$.

Q: Find the length of the curves;

33) $x = \cos t$, $y = t + \sin t$, $0 \le t \le \pi$

34) $x = t^3$, $y = 3t^2/2$, $0 \le t \le \sqrt{3}$

35) $x = t^2/2$, $y = \frac{(2t+1)^{3/2}}{3}$, $0 \le t \le 4$

36) $x = \frac{(2t+3)^{3/2}}{3}$, $y = t + t^2/2$, $0 \le t \le 3$.

37) $x = 8\cos t + 8t\sin t$
$y = 8\sin t - 8t\cos t$
$0 \le t \le \pi/2$.

38) Q: Find the Surface Area of the surfaces generated by revolving the curve about the indicated axes,

38) $x = \cos t$, $y = 2 + \sin t$, $0 \le t \le 2\pi$, x-axis.

39) $x = (2/3)t^{3/2}$, $y = 2\sqrt{t}$, $0 \le t \le \sqrt{3}$, y-axis.

40) $x = t + \sqrt{2}$, $y = (t^2/2) + \sqrt{2t}$, $-\sqrt{2} \le t \le \sqrt{2}$, y-axis.

Q: plot the following points. Then find all the polar coordinates of each point.

41) $(3, \pi/4)$ 42) $(3, \pi/3)$ 43) $(-3, \pi/4)$, 44) $(\phi, \pi/2)$, 45) $(-\sqrt{2}, \pi/4)$

46) $(-3, \pi/3)$ 47) $(2, \pi/2)$ 48) $(4, \pi)$, 49) $(5, \pi/3)$

50) $(2, \pi/6)$ 51) $(-2, \pi/6)$ 52) $(1, \pi/4)$ 53) $(1, 0)$ 54) $(2, 2\pi/3)$

55) $(1/2, \pi/3)$ 56) $(4, \pi/6)$ 57) $(-1/2, \pi/3)$ 58) $(-4, 2\pi/3)$ 59) $(2, \pi)$

60) $(3, 2\pi/3)$ 61) $(3, \pi/2)$ 62) $(5, 2\pi/3)$ 63) $(1, 2\pi/3)$ 64) $(1, \pi/4)$

65) $(4, 0)$ 66) $(\sqrt{3}, \pi/4)$ 67) $(\sqrt{3}, \pi/4)$ 68) $(2, 3\pi/2)$.

Q: Replace the polar equations with equivalent Cartesian equation. Then identify the graph. Graph the polar curve also

69) $r\cos\theta = 2$, 70) $r = -1 - \cos\theta$, 71) $r = 1/2 + \cos\theta$.

72) $r = 2 + \cos\theta$.

Also find the area of these regions.