34. Integrate the velocity vector to find the position vector: $s(t) = \langle -2\cos t + C_1, 3\sin t + C_2 \rangle$.

Substitute $t = 0$ to evaluate the two constants, C_1 and C_2:

$$-2\cos(0) + C_1 = 1 \Rightarrow C_1 = 3 \text{ and } 3\sin(0) + C_2 = 1 \Rightarrow C_2 = 1$$

So the position vector is $\langle -2\cos t + 3, 3\sin t + 1 \rangle$. Substitute $t = 2$ to find the position vector:

$$\langle -2\cos(2) + 3, 3\sin(2) + 1 \rangle = \langle 3.832, 3.728 \rangle.$$

The correct choice is (A).

3. For the particle to be at rest both $\frac{dx}{dt}$ and $\frac{dy}{dt}$ must both equal zero at the same time.

$\frac{dx}{dt} = t^3 - 3t^2 - 4t = t(t^2 - 3t - 4) = t(t+1)(t-4)$. Therefore $\frac{dx}{dt} = 0$ at $t = -1, 0$, and 4.

$\frac{dy}{dt} = t^3 - 16t = t(t^2 - 16) = t(t+4)(t-4)$. Therefore $\frac{dy}{dt} = 0$ at $t = -4, 0$, and 4.

Thus $\frac{dx}{dt}$ and $\frac{dy}{dt}$ both equal 0 at $t = 0$ and at $t = 4$, at which times the particle is at rest.

The correct choice is (A).

4. Since $x = 2t + 3$ and $y = t^2 + 2t$, $\frac{dy}{dt} = 2t + 2$ and $\frac{dx}{dt} = 2$.

So $\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{2t + 2}{2} = \frac{2(t + 1)}{2} = t + 1$.

At $t = 1$, $\frac{dy}{dx} = 2$. When $t = 1$, $x = 5$ and $y = 3$.

So the tangent line to the curve at $t = 1$ is $y - 3 = 2(x - 5)$ or $y = 2x - 7$.

The correct choice is (A).

20. The two circles, $r = 2\cos\theta$ and $r = 2\sin\theta$, intersect at the pole since $\left(0, \frac{\pi}{2}\right)$ satisfies the first equation and $(0,0)$ the second equation. The other intersection point $\left(\sqrt{2}, \frac{\pi}{4}\right)$ is where

$2\cos\theta = 2\sin\theta$, or $\sin\theta = \cos\theta$.

Therefore, the area $A = 2\int_0^{\frac{\pi}{4}} \frac{1}{2}(2\sin\theta)^2\, d\theta = 4\int_0^{\frac{\pi}{4}} \sin^2\theta\, d\theta$

The correct choice is (B).

24. The acceleration vector is the second derivative of the position vector, hence

$$x = 4t^2 \Rightarrow x' = 8t \Rightarrow x'' = 8\text{; and } y = \sqrt{t} = t^{\frac{1}{2}} \Rightarrow y' = \frac{1}{2}t^{-\frac{1}{2}} \Rightarrow y'' = -\frac{1}{4}t^{-\frac{3}{2}} = \frac{-1}{4t^{\frac{3}{2}}}.$$

Therefore, at $t = 4$, the acceleration vector is $\left\langle 8, -\frac{1}{32} \right\rangle$.

The correct choice is (B).

37. Area, $A = \frac{1}{2}\int_0^{\pi}(6\cos\theta + 8\sin\theta)^2 d\theta = 25\pi \approx 78.540.$

This could be done by paper and pencil, but the better approach is with the use of a calculator. The equation is a circle with center at (3,4) and radius 5.

The correct choice is (C).