**1.** Antidifferentiating both sides of the equation gives

$$f(x) = e^x + \cos(x) + C.$$

Letting $x = 0$, by the initial condition we get

$$f(0) = e^0 + \cos(0) + C = 1,$$

that is, $1 + 1 + C = 1$ or $C = -1$. Therefore,

$$f(x) = \boxed{e^x + \cos(x) - 1}.$$

**2.** Antidifferentiating the equation $s''(t) = -1$ gives

$$s'(t) = -t + C.$$

Using the condition $s'(0) = 3$ we get $C = 3$, and so

$$s'(t) = -t + 3.$$

Antidifferentiating this equation we get

$$s(t) = -\frac{t^2}{2} + 3t + C.$$

Using the condition $s(0) = 7$ we get $C = 7$, and so

$$s(t) = \boxed{-\frac{t^2}{2} + 3t + 7}.$$

**3.**

$$\int_0^1 (x^2 - 2x + 2)dx = \left[\frac{x^3}{3} - x^2 + 2x\right]_0^1 = \boxed{\frac{4}{3}}.$$

**4.**

$$\int (x^{-2} - x^{\frac{1}{3}} - 2x^{-\frac{1}{2}} + 3)dx = \boxed{-\frac{1}{x} - \frac{3}{4}x^{\frac{4}{3}} - 4x^{\frac{1}{2}} + 3x + C}.$$

**5.**

$$\int_1^e \frac{3}{x}dx = 3\int_1^e \frac{1}{x}dx = 3\left[\ln x\right]_1^e = 3[\ln e - \ln 1] = 3[1 - 0] = \boxed{3}.$$

**6.** Using substitution $u = 3\theta$, we have $du = 3d\theta, d\theta = \frac{du}{3}$, and so

$$\int_0^{\pi/2} 2\cos(3\theta)d\theta = \int_0^{3\pi/2} 2\cos(u)\frac{du}{3} = \frac{2}{3}\int_0^{3\pi/2} \cos(u)du = \frac{2}{3}\left[\sin(u)\right]_{u=0}^{u=3\pi/2} = \boxed{-\frac{2}{3}}.$$

**7.** Using substitution $u = 2 - x^2$, we have $du = -2xdx, dx = \frac{du}{-2x}$, and so

$$\int 3x\sqrt{2-x^2}dx = \int 3x\sqrt{u}\frac{du}{-2x} = -\frac{3}{2}\int \sqrt{u}du = -\frac{3}{2}\cdot\frac{2}{3}u^{3/2} = -u^{3/2} = \boxed{-(2-x^2)^{3/2} + C}.$$

**8.** Using substitution $u = \cos(x)$, we have $du = -\sin x\ dx, dx = \frac{du}{-\sin x}$, and so

$$\int_0^{\pi/3} 2\cos^2(x)\sin(x)dx = \int_{u(0)}^{u(\pi/3)} 2u^2\sin(x)\frac{du}{-\sin x} = -2\int_1^{1/2} u^2du = -2\left[\frac{u^3}{3}\right]_1^{1/2} = \boxed{7/12}.$$

**9.** By the FTC, $F'(x) = \boxed{e^{-x^2}}$.