4 $\displaystyle\int \left(\frac{\sqrt{\pi}}{x^5} + \frac{e^2}{\sqrt{x}} \right) dx$

$$= \sqrt{\pi} \int \frac{1}{x^5}\, dx + e^2 \int \frac{1}{\sqrt{x}}\, dx$$

$$= \sqrt{\pi} \int x^{-5}\, dx + e^2 \int x^{-\frac{1}{2}}\, dx$$

$$= \sqrt{\pi}\, \frac{x^{-4}}{-4} + e^2 \cdot \frac{x^{\frac{1}{2}}}{\frac{1}{2}} + C$$

$$= \boxed{-\frac{\sqrt{\pi}}{4x^4} + 2e^2 x^{1/2} + C}$$

5 $f'(x) = 5x^2 + 7x - 7$, $f(0) = 4$

$$f(x) = \int (5x^2 + 7x - 7)\, dx$$

$$= \int 5x^2\, dx + \int 7x\, dx - \int 7\, dx$$

$$= \frac{5x^3}{3} + \frac{7x^2}{2} - 7x + C$$

$$f(0) = 4 = \frac{5\cdot(0)^3}{3} + \frac{7\cdot(0)^2}{2} - 7(0) + C$$

$$\Rightarrow C = 4$$

$$\therefore \boxed{f(x) = \frac{5x^3}{3} + \frac{7x^2}{2} - 7x + 4}$$

6 $\displaystyle\int \frac{e^{3\sqrt{z}}}{\sqrt{z}}\, dz = \int e^{3u} \cdot 2\, du$

Let $u = \sqrt{z}$ $\quad = 2\int e^{3u}\, du$

$\dfrac{du}{dz} = \dfrac{1}{2\sqrt{z}}$ $\quad = 2\dfrac{e^{3u}}{3} + C$

$\Rightarrow 2\, du = \dfrac{dz}{\sqrt{z}}$ $\quad = \boxed{2\dfrac{e^{3\sqrt{z}}}{3} + C}$