

$$a) \int_0^1 \sqrt{2} t^4 + e^\pi t^2 - 2t \ln 2 + 1 dt$$

$$= \sqrt{2} \frac{t^5}{5} \Big|_0^1 + e^\pi \frac{t^3}{3} \Big|_0^1 - 2 \ln 2 \frac{t^2}{2} \Big|_0^1 + t \Big|_0^1$$

$$= \frac{\sqrt{2}}{5} + \frac{e^\pi}{3} - \frac{2 \ln 2}{2} + 1 = \boxed{\frac{\sqrt{2}}{5} + \frac{e^\pi}{3} - \ln 2 + 1}$$

$$b) \int \sqrt{7} x^5 \sin(x^6) dx = \frac{\sqrt{7}}{6} \int \sin u du = \frac{\sqrt{7}}{6} (-\cos u) + C$$

$$u = x^6$$

$$du = 6x^5 dx$$

$$= \boxed{-\frac{\sqrt{7}}{6} \cos(x^6) + C}$$