(1) [2] Compute $h'(x)$ where $h(x) = \int_0^{x^2} \sqrt{1+r^3}\, dr$.

$$h'(x) = \sqrt{1+(x^2)^3}\,(2x)$$
$$= \boxed{\sqrt{1+x^6}\,(2x)}$$

(2) [3] Determine $\int x^2 e^{x^3}\, dx$.

let $u = x^3$
$du = 3x^2\, dx$

$$\therefore \int x^2 e^{x^3} dx = \frac{1}{3}\int e^u\, du$$
$$= \frac{1}{3} e^u + C$$
$$= \boxed{\frac{1}{3} e^{x^3} + C}$$

(3) [5] Evaluate $\displaystyle\int_0^{\pi/2} \cos(x)\sin(\sin(x))\,dx$.

Let $u = \sin(x)$, $du = \cos(x)\,dx$ $\Big\}$ $x=0 \Rightarrow u=0$, $x=\frac{\pi}{2} \Rightarrow u = \sin(\frac{\pi}{2}) = 1$

$$\therefore I = \int_0^1 \sin(u)\,du$$

$$= -\cos(u)\Big|_0^1$$

$$= -\cos(1) - (-\cos(0))$$

$$= \boxed{1-\cos(1)}$$

(4) [5] Determine $\displaystyle\int t^5 \ln t\,dt$.

$u = \ln(t)$ $dv = t^5\,dt$

$du = \frac{1}{t}\,dt$ $v = \frac{t^6}{6}$

$$I = \int u\,dv = uv - \int v\,du$$

$$= \frac{t^6 \ln(t)}{6} - \int \frac{t^6}{6}\frac{1}{t}\,dt$$

$$= \frac{t^6 \ln(t)}{6} - \frac{1}{6}\int t^5\,dt$$

$$= \boxed{\frac{t^6 \ln(t)}{6} - \frac{1}{36}t^6 + C}$$