a.) $\int x\sin(2x)\,dx$, $u = x$, $dv = \sin(2x)\,dx$

$du = 1\,dx$, $v = -\frac{1}{2}\cos(2x)$,

$$\int x\sin(2x)\,dx = -\tfrac{1}{2}\cos(2x)\,x - \int -\tfrac{1}{2}\cos(2x)\,dx$$

$$= -\frac{1}{2}\left[x\cos(2x) - \int \cos(2x)\,dx\right]$$

$$= -\frac{1}{2}\left[x\cos(2x) - \frac{1}{2}\sin(2x)\right]$$

$$= \boxed{\frac{1}{4}\sin(2x) - \frac{1}{2}x\cos(2x) + C.}$$

b.) $\int xe^{x^2}\,dx$, $u = x^2$, $du = 2x\,dx$

$$\int \sqrt{u}\,e^{u}\,\frac{1}{2\sqrt{u}}\,du = \frac{1}{2}\int e^{u} = \frac{1}{2}e^{u}$$

$$= \boxed{\frac{1}{2}e^{x^2} + C.}$$

c.) $\int x e^x \, dx$, $u = x$, $du = 1dx$, $dv = e^x \, dx$, $v = e^x$,

$$\int xe^x \, dx = xe^x - \int e^x \, dx$$

$$= xe^x - e^x = \boxed{e^x(x-1) + C.}$$

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d.) $$\int e^{x^2} \, dx = \boxed{x + \frac{x^3}{3} + \frac{x^5}{10}, \text{ at } x=0.}$$

e) $\int x\sqrt{1+x}\,dx$, $u = 1+x$, $du = 1\,dx$,

$$\int x\sqrt{1+x}\,dx \rightarrow \int (u-1)\sqrt{u}\,du$$

$$= \int u\sqrt{u} - \sqrt{u}\,du =$$

$$\int u\sqrt{u}\,du - \sqrt{u}\,du = \int u^{\frac{3}{2}} - u^{1/2}\,du$$

$$= \frac{u^{5/2}}{5/2} - \frac{u^{3/2}}{3/2} = \frac{2}{5}u^{5/2} - \frac{2}{3}u^{3/2}$$

$$= \boxed{\frac{2}{5}(1+x)^{5/2} - \frac{2}{3}(1+x)^{3/2} + C.}$$

f.) $\int \sec(\theta)\, d\theta = \int \sec(\theta) \dfrac{(\sec(\theta)+\tan(\theta))}{(\sec(\theta)+\tan(\theta))}\, d\theta$

$$= \int \frac{\sec^2(\theta) + \sec(\theta)\tan(\theta)}{\sec(\theta) + \tan(\theta)}\, d\theta,$$

$u = \sec(\theta) + \tan(\theta)$, $du = [\sec(\theta)\tan(\theta) + \sec^2(\theta)]\, d\theta$

$$\int \frac{\sec^2(\theta) + \sec(\theta)\tan(\theta)}{\sec(\theta) + \tan(\theta)}\, d\theta \longrightarrow$$

$$\int \frac{1}{u}\, du = \ln|u|$$

$$= \boxed{\ln|\sec(\theta) + \tan(\theta)| + C.}$$

g.) $\int \sec^2(\theta)\, d\theta$, $u = \tan(\theta) = \dfrac{\sin^2(\theta)}{\cos^2(\theta)}$;

$$\frac{du}{d\theta} = \frac{1}{\cos^2(\theta)} \text{ ;}$$

$$\int \sec^2(\theta)\, d\theta = \int \frac{1}{\cos^2(\theta)}\, d\theta$$

$$= \boxed{\tan(\theta) + C.}$$

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h.) $\int \operatorname{sech}^2(\theta)\, d\theta = \int \dfrac{1}{\cosh^2(\theta)}\, d\theta$,

$\cosh(\theta) = \dfrac{e^{\theta} + e^{-\theta}}{2}$, $\int \dfrac{1}{\cosh^2(\theta)}\, d\theta =$

$$\int \frac{1}{\left(\frac{e^{\theta}+e^{-\theta}}{2}\right)^2}\, d\theta = \boxed{-\frac{2}{e^{2x}+1} + C.}$$

i.) $\int \frac{x^2+2}{7-x^2}\,dx =$

$$\boxed{\frac{-\left(9\sqrt{7}\ln|x-\sqrt{7}| - 9(\sqrt{7})\ln|x+\sqrt{7}| + 14x\right)}{14} + C.}$$

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j.) $\int \frac{1}{ap-bp^2}\,dp = \boxed{\frac{-\ln\left(\frac{|pb-a|}{|p|}\right)}{a} + C.}$