1 a) $\int \sqrt{x}\,\sqrt[3]{x}\,dx =$

$$= \int x^{\frac{5}{6}}\,dx$$

$$= \frac{x^{\frac{5}{6}+1}}{\frac{5}{6}+1}$$

$$= \frac{6}{11}x^{\frac{11}{6}} = \boxed{\frac{6}{11}x^{\frac{11}{6}} + C}$$

1 b) $\int \cot g\,\theta\ \sec\theta\ d\theta$

$$\int \frac{\cos\theta}{\operatorname{sen}\theta} \cdot \frac{1}{\cos\theta}\,d\theta$$

$$= \int \frac{1}{\operatorname{sen}\theta}\,d\theta$$

$$= \int \frac{1}{\operatorname{sen}\theta} \cdot \frac{\operatorname{sen}\theta}{\operatorname{sen}\theta}\,d\theta$$

$$= \int \frac{\operatorname{sen}\theta}{\operatorname{sen}\theta^2}\,d\theta$$

$$\boxed{\int \frac{\operatorname{sen}\theta}{1-\cos\theta^2}\,d\theta}$$

1c) $\int (x+1)^2 . (x-1)^2 \, dx$

$\int ((x+1).(x-1))^2 dx$

$\int (x^2-1)^2 \, dx$

$\int x^4 - 2x^2 + 1 dx$

$\int x^4 dx - \int 2x^2 dx + \int 1 dx$

$\boxed{\frac{x^5}{5} - \frac{2x^3}{3} + x}$

2a) $\int \sec^2 (2x-1) dx$

$u = 2x-1 \qquad \int \sec^2 (u) \frac{1}{2} \, du$

$= \frac{1}{2} . \int \sec^2 (u) \, du$

$= \frac{1}{2} . \tan (u)$

$\boxed{\frac{1}{2} . \tan (u) + C}$

2) b) $\int \sqrt{x^2 - 5x^4}\, dx$

$$\int x\sqrt{1-5x^2}\, dx$$

$$= \int -\frac{\sqrt{u}}{10}\, du$$

$$= \int -\frac{1}{10} \cdot \int \sqrt{u}\, du$$

$$= -\frac{1}{10} \cdot \int u^{\frac{1}{2}}\, du$$

$$= -\frac{1}{10} \cdot \frac{u^{\frac{1}{2}+1}}{\frac{1}{2}+1}$$

$$= -\frac{1}{10} \cdot \frac{(1-5x^2)^{\frac{1}{2}+1}}{\frac{1}{2}+1}$$

$$= -\frac{1}{15}(1-5x^2)^{\frac{3}{2}}$$

$$\boxed{= -\frac{1}{15}(1-5x^2)^{\frac{3}{2}} + C}$$

2c) $\int x^2 \cdot e^{-x^3} dx$

$u = -x^3$

$u = -3x^2 dx$

$dx = \frac{du}{-3x^2}$

$\int \cancel{x^2} \cdot e^{u} \frac{du}{-3\cancel{x^2}}$

$-\frac{1}{3} \int e^{u} du$

$$\boxed{-\frac{1}{3} \cdot e^{-3x} + C}$$

③ a) $\int x^2 \cdot e^{-x}\, dx$

$u = x^2$
$du = 2x\,dx$
$v = e^{-x}$
$dv = -e^{-x}\,dx$

$\int u\,du = u.v - \int v\,du$

$\int x^2 \cdot -e^{-x}\,dx = -x^2 \cdot e^{-x} - \int e^{-x} \cdot 2x\,dx$

$u = 2x$
$v = -e^{-x}$
$du = 2dx$
$dv = e^{-x}$

$\int x^2 \cdot -e^{-x}\,dx = -x^2 \cdot e^{-x} - 2x$

$$\int x^2 \cdot -e^{-x}\,dx = -x^2 \cdot e^{-x} - 2x \cdot e^{-x} + \int 2e^{-x}\,dx$$

$$\int x^2 \cdot -e^{-x}\,dx = \boxed{-x^2 \cdot e^{-x} - 2x \cdot e^{-x} + \int 2e^{-x}\,dx + c}$$

③ b) $\int e^{2x} \cdot \operatorname{sen} x\, dx$

③ b) $\int e^{2x} \cdot \operatorname{sen} x\, dx$

$u = \operatorname{sen} x$
$du = \cos x\,dx$
$v = \frac{e^{2x}}{2}$
$dv = e^{2x}\,dx$

$$\int e^{2x} \operatorname{sen} x\,dx = \frac{\operatorname{sen} x \cdot e^{2x}}{2} - \int \frac{e^{2x}}{2} \cdot \cos x\,dx$$

$$\int e^{2x} \cdot \operatorname{sen} x\,dx = \frac{\operatorname{sen} x \cdot e^{2x}}{2} - \frac{1}{2} \cdot \int e^{2x} \cdot \cos x\,dx$$

$u = \cos x$ | $du = -\operatorname{sen} x\,dx$
$v = \frac{e^{2x}}{2}$ | $dv = e^{2x}\,dx$

$$\int e^{2x} \operatorname{sen} x \, dx = \frac{e^{2x} \operatorname{sen} x}{2} \cdot \frac{e^{2x} \cos x}{4} - \frac{1}{4} \cdot \int e^{2x} \operatorname{sen} x \, dx$$

$$\int e^{2x} \cdot \operatorname{sen} x \, dx + \frac{1}{4} \int e^{2x} \operatorname{sen} x \, dx = \frac{e^{2x} \operatorname{sen} x}{2} - \frac{e^{2x} \cos x}{4}$$

$$\frac{5}{4} \int e^{2x} \operatorname{sen} x \, dx = \frac{e^{2x} \operatorname{sen} x}{2} - \frac{e^{2x} \cos x}{4}$$

$$\int e^{2x} \operatorname{sen} x \, dx = \boxed{\frac{4}{5} \left(\frac{e^{2x} \operatorname{sen} x}{2} - \frac{e^{2x} \cos x}{4} \right) + C}$$