3) $\sin 7x \cos 2x$

4) $(2x-3)^2/1-x$

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1.) $3te^{2t}$

Let $u = 3t$ $\qquad$ $dv = e^{2t}$

$du/dt = 3$ $\qquad$ $\int dv = \int e^{2t}$

$du = 3dt$ $\qquad$ $v = \dfrac{e^{2t}}{2}$

Using $uv - \int v\,du - \int u\,dv$

$$= 3t\left(\frac{e^{2t}}{2}\right) - \int \frac{e^{2t}}{2} \times 3dt$$

$$3t\left(\frac{e^{2t}}{2}\right) - \frac{1}{2}\int 3e^{2t}\,dt$$

$$3t\left(\frac{e^{2t}}{2}\right) - \frac{1}{2} \times \frac{3e^{2t}}{2} + c$$

$$\left(\frac{3}{2}te^{2t} - \frac{3e^{2t}}{4}\right) + c$$

$\int x^2 \sin x$

Let $u = x^2$ and $dx = \sin x$

$du/dx = 2x$ and $v = -\cos x$

Using $uv - \int v\,du$

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

$-x^2 \cos x - \int -2x \cos x\,dx$

Let $u = -2x$ and $du = \cos 3x$

$du/dx = -2x$ and $v = \sin x$

$\therefore (-2x)(\sin x) - \int (\sin x)(-2)\,dx$

$-2x \sin x - (-2)\int \sin x\,dx$

$-2x \sin x - (-2) - \cos x + c$

$-2x \sin x - 2\cos x + c$

$\therefore \int x^2 \sin x = -x^2 \cos x - 2x \sin x - 2\cos x + c$

3) $\int \sin 7x \cos 2x$

Let $A = 7x$, $B = 2x$

$\int \sin 7x \cos 2x = \frac{1}{2}(\sin(7x + 2x) + \sin(7x - 2x))$

$\int \sin 7x \cos 2x = \frac{1}{2}(\sin 9x + \sin 5x)$

$= \frac{1}{2}\int [\sin 9x/9 + \sin 5x/5]$

$= \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + c$

4) $\dfrac{2x-3x^2}{1-x}$

$$
\begin{array}{r|l}
 & 2x - x^2 \\
\hline
1-x & 2x - 3x^2 \\
 & -\underline{(2x - 2x^2)} \\
 & -x^2 \\
 & -\underline{(-x^2 + x^3)} \\
 & -x^3
\end{array}
$$

$$\therefore \int (2x - x^2)\,dx + \int \frac{x^3}{1-x}\,dx$$

$$= \frac{2x^2}{2} - \frac{x^3}{3} + x^3 \ln(1-x)$$