1. $\int x^3 \sin x \, dx$

Alt. Signs	u and derivatives	dv and antiderivatives
+	x^3	$\sin x$
−	$3x^2$	$-\cos x$
+	$6x$	$-\sin x$
−	6	$\cos x$
+	0	$\sin x$

$$\int x^3 \sin x \, dx = \boxed{-x^3\cos x + 3x^2 \sin x + 6x\cos x - 6\sin x + C}$$

2. $\int x^4 e^x \, dx$

Alt. Signs	u and deriv.	dv and antideriv.
+	x^4	e^x
−	$4x^3$	e^x
+	$12x^2$	e^x
−	$24x$	e^x
+	24	e^x
−	0	e^x

$$\int x^4 e^x \, dx = \boxed{x^4 e^x - 4x^3 e^x + 12x^2 e^x - 24x e^x + 24e^x + C}$$

3. $\int x^2 (x-2)^{\frac{3}{2}} \, dx$

Alt. Signs	u and deriv	dv and antideriv
+	x^2	$(x-2)^{3/2}$
−	$2x$	$\frac{2}{5}(x-2)^{5/2}$
+	2	$\frac{4}{35}(x-2)^{7/2}$
	0	$\frac{8}{315}(x-2)^{9/2}$

$$\int x^2 (x-2)^{\frac{3}{2}} dx = \boxed{\frac{2}{5}x^2(x-2)^{\frac{5}{2}} - \frac{8}{35}x(x-2)^{\frac{7}{2}} + \frac{16}{315}(x-2)^{\frac{9}{2}} + C}$$

4. $\int x^2 e^{x^3}\, dx$

$u = x^3$

$du = 3x^2$

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

5. $\int x \sec^2 x \, dx$

$u = x \qquad dv = \sec^2 x \, dx$

$du = dx \qquad v = \tan x$

$x \tan x - \int \tan x \, dx$

$\boxed{x \tan x + \ln|\cos x| + C}$

6. $\int e^{2x} \sin x \, dx$

$u = e^{2x} \qquad dv = \sin x \, dx$

$du = 2e^{2x} dx \qquad v = -\cos x$

$u = 2e^{2x} \qquad dv = \cos x \, dx$

$du = 4e^{2x} dx \qquad v = \sin x$

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

$\int e^{2x} \sin x \, dx = -e^{2x} \cos x + 2e^{2x} \sin x - \int 4e^{2x} \sin x \, dx$

$\int e^{2x} \sin x \, dx = -e^{2x} \cos x + 2e^{2x} \sin x - 4\int e^{2x} \sin x \, dx$

$5\int e^{2x} \sin x \, dx = -e^{2x} \cos x + 2e^{2x} \sin x$

$\int e^{2x} \sin x \, dx = \boxed{-\frac{1}{5}e^{2x} \cos x + \frac{2}{5}e^{2x} \sin x + C}$

7. $\int e^{-x} \cos 3x \, dx$

$u = \cos 3x \qquad dv = e^{-x} dx$

$du = -3 \sin 3x \, dx \qquad v = -e^{-x}$

$\int e^{-x} \cos 3x \, dx = -e^{-x} \cos 3x - \int 3e^{-x} \sin 3x \, dx$

$u = 3 \sin 3x \qquad dv = e^{-x} dx$

$du = 9 \cos 3x \, dx \qquad v = -e^{-x}$

$\int e^{-x} \cos 3x \, dx = -e^{-x} \cos 3x - \left[-3e^{-x} \sin 3x + \int 9e^{-x} \cos 3x \, dx \right]$

$\int e^{-x} \cos 3x \, dx = -e^{-x} \cos 3x + 3e^{-x} \sin 3x - 9 \int e^{-x} \cos 3x \, dx$

$10 \int e^{-x} \cos 3x \, dx = -e^{-x} \cos 3x + 3e^{-x} \sin 3x$

$\int e^{-x} \cos 3x \, dx = \boxed{-\frac{1}{10} e^{-x} \cos 3x + \frac{3}{10} e^{-x} \sin 3x + C}$

8. $\int \frac{\cos(\ln x)}{x} \, dx$

$u = \ln x$

$du = \frac{1}{x} dx$

$\int \cos u \, du$

$\sin u + C = \boxed{\sin(\ln x) + C}$

9 & 10 - Answers in class