

u-sub

$$8. \int x^2 (x^3 + 5)^9 dx$$

$$u = x^3 + 5$$

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

$$\int x^2 u^9 \frac{du}{3x^2} = \frac{1}{3} \int u^9 du = \frac{1}{3} \frac{u^{10}}{10} + C$$

$$= \frac{1}{30} (x^3 + 5)^{10} + C$$

$$12. \int e^x \cos(e^x) dx$$

$$u = e^x$$

$$du = e^x dx$$

$$= \int \cos(u) du = \sin(u) + C = \underline{\sin(e^x) + C}$$

$$16. \int \frac{\sin(\sqrt{x})}{\sqrt{x}} dx$$

$$u = \sqrt{x}$$

$$du = \frac{1}{2} x^{-1/2} dx = \frac{1}{2\sqrt{x}} dx$$

$$\text{so } dx = 2\sqrt{x} du$$

$$= 2 \int \sin(u) du = -2 \cos(u) + C = \underline{-2 \cos(\sqrt{x}) + C}$$

$$24. \int \frac{\sin(\ln(x))}{x} dx$$

$$u = \ln(x)$$

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

$$= \int \sin(u) du = -\cos(u) + C = \underline{-\cos(\ln(x)) + C}$$

$$36. \int \frac{x}{1+x^2} dx$$

$$u = x^2$$

$$du = 2x dx \text{ so } dx = \frac{du}{2x}$$

$$= \frac{1}{2} \int \frac{1}{1+u^2} du = \frac{1}{2} \arctan(u) + C$$

$$= \underline{\frac{1}{2} \arctan(x^2) + C}$$

u-sub con't

$$41. \int_0^1 \cos(\pi t/2) dt$$

$$u = \pi t/2$$

$$du = \frac{\pi}{2} dt, \text{ so } dt = \frac{2}{\pi} du$$

$$= \frac{2}{\pi} \int_0^{\pi/2} \cos(u) du$$

x	u
0	0
1	$\pi/2$

$$= \frac{2}{\pi} \left(\sin(u) \Big|_0^{\pi/2} \right) = \frac{2}{\pi} \left(\sin(\pi/2) - \sin(0) \right) = \underline{\underline{\frac{2}{\pi}}}$$

$$42. \int_0^1 (3t-1)^{50} dt$$

$$u = 3t-1$$

$$du = 3 dt, \text{ so } dt = \frac{du}{3}$$

x	u
0	-1
1	2

$$= \frac{1}{3} \int_{-1}^2 u^{50} du = \frac{1}{3} \frac{u^{51}}{51} \Big|_{-1}^2 = \frac{2^{51}}{153} - \frac{(-1)^{51}}{153} = \frac{2^{51} + 1}{153}$$