

Section 4.5 #30.

$$\int \left(\frac{t+2t^2}{\sqrt{t}} \right) dt = \int \left(\frac{t}{\sqrt{t}} + 2 \frac{t^2}{\sqrt{t}} \right) dt = \int \left(t^{1/2} + 2t^{3/2} \right) dt$$

$$= \frac{t^{3/2}}{3/2} + \frac{2t^{5/2}}{5/2} + C = \boxed{\frac{2}{3} t^{3/2} + \frac{2}{5} t^{5/2} + C}$$

#46.

with the
substitution

$$\int \cos(6x) dx$$

$$u=6x \Rightarrow du=6dx \Rightarrow dx=\frac{du}{6}$$

$$\int \cos(u) \frac{du}{6} = \frac{1}{6} \int \cos(u) du = \frac{1}{6} \sin u + C = \boxed{\frac{1}{6} \sin(6x) + C}$$

#48.

with
the
substitution

$$\int x \sin(x^2) dx$$

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

$$\int x \sin(u) \frac{du}{2x} = \frac{1}{2} \int \sin u du = \frac{1}{2} (-\cos u) + C = -\frac{1}{2} \cos(x^2) + C$$

#66.

substitute

$$\int (x+1) \sqrt{2-x} dx$$

$$u=2-x \Rightarrow x=2-u$$

$$du=-dx$$

$$\int (2-u+1) \sqrt{u} (-du) = -\int (3-u) u^{1/2} du = -\int (3u^{1/2} - u^{3/2}) du$$

$$= -\left(3 \frac{u^{3/2}}{3/2} - \frac{u^{5/2}}{5/2} \right) + C = -2u^{3/2} + \frac{2}{5} u^{5/2} + C$$

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

#68.

$$\int \frac{2x+1}{\sqrt{x+4}} dx$$

$$u=x+4 \Rightarrow x=u-4$$

$$du=dx$$

$$\int \frac{2(u-4)+1}{\sqrt{u}} du = \int \frac{2u-7}{\sqrt{u}} du = \int (2u^{1/2} - 7u^{-1/2}) du =$$

$$= 2 \frac{u^{3/2}}{3/2} - \frac{7u^{1/2}}{1/2} + C = \frac{4}{3} u^{3/2} - 14u^{1/2} + C = \boxed{\frac{4}{3} (x+4)^{3/2} - 14(x+4)^{1/2} + C}$$

#76.

$$\int_0^2 \frac{x}{\sqrt{1+2x^2}} dx$$

$$u=1+2x^2$$

$$du=4x dx$$

$$= \int_1^9 \frac{1}{\sqrt{u}} \frac{du}{4} = \frac{1}{4} \int_1^9 u^{-1/2} du$$

$$= \frac{1}{4} \frac{u^{1/2}}{1/2} \Big|_1^9 = \frac{1}{2} (\sqrt{9} - \sqrt{1}) = \frac{1}{2} (3-1) = \boxed{1}$$

lower $x=0 \Rightarrow u=1+2 \cdot 0^2=1$
upper $x=2 \Rightarrow u=1+2 \cdot 2^2=9$