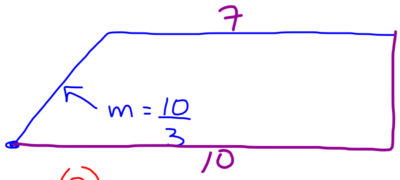
2000

\# 2

$\frac{1}{2}(10)(7+10)$



a. $y = \frac{10}{3}x$ (2)

b. A $\frac{10}{3}$ B $\frac{24t}{2t+3}$

$$\frac{(2t+3)(24)-(24t)(2)}{(2t+3)^2}$$

$$\left.\frac{72}{(2t+3)^2}\right|_{t=2} = \frac{72}{49}$$

$$\int_0^{10} \frac{24t}{2t+3}\,dt = 83.336 \text{ meters}$$

27.

$$\int \sqrt{\tan x}\ \boxed{\sec^2 x\, dx}$$

$u = \tan x$

$du = \sec^2 x\, dx$

$$\int u^{\frac{1}{2}}\, du$$

$$\frac{2}{3}u^{\frac{3}{2}} + C$$

$$\frac{2}{3}(\tan x)^{\frac{3}{2}} + C$$

3. $\int t^2 - \frac{1}{t^2} \, dt$ $\quad t^{-2}$

$\frac{t^3}{3} - \frac{t^{-1}}{-1} + C$

33. $\int \frac{\ln^6 x}{x} \, dx = \int \frac{(\ln x)^6}{x} \, dx$

$u = \ln x$

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

$\int \frac{u^6}{\cancel{x}} \cancel{x} \, du$

$\int u^6 du$

$\frac{u^7}{7} + C \qquad \frac{(\ln x)^7}{7} + C$

37.

$$\int \frac{\sin(2t+1)}{\cos^2(2t+1)}\,dt \qquad u=\cos(2t+1)$$

$$\frac{du}{-2\sin(2t+1)} = \cancel{-\sin(2t+1)\cdot 2\,dt}$$

$$\int \frac{\cancel{\sin(2t+1)}}{u^2}\cdot\frac{du}{-2\cancel{\sin(2t+1)}}$$

$$\frac{-1}{2}\int \frac{1}{u^2}\,du \qquad u^{-2}$$

$$+\frac{1}{2}\left(\frac{u^{-1}}{+1}\right)+C$$

$$\frac{1}{2u}+C$$

$$\frac{1}{2\cos(2t+1)}+C$$

21.

$$\int \frac{dx}{x^2+9} \qquad 3u=\frac{x}{\cancel{3}}$$

$$3\cdot du=\frac{1}{\cancel{3}}\,dx$$

$$\int \frac{3\,du}{(3u)^2+9}$$

$$\int \frac{3}{9u^2+9}\,du$$

$$\int \frac{\cancel{3}}{3\cancel{9}(u^2+1)}\,du$$

$$\frac{1}{3}\int \frac{1}{u^2+1}\,du$$

$$\frac{1}{3}\tan^{-1}u \quad +C$$

$$\frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right)+C$$

39. $\int \frac{dx}{x \ln x}$

$u = \ln x$

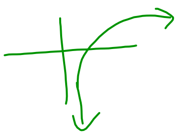
$x \cdot du = \frac{1}{x}\, dx$

$\int \frac{\cancel{x}\, du}{\cancel{x}\, u}$

$\int \frac{1}{u}\, du$

$\ln|u| + C$

$\ln\left|\ln x\right| + C$



$$\int \frac{dx}{\cos^2 2x}$$

$u = 2x$

$\frac{du}{2} = \frac{\cancel{2}}{\cancel{2}}\, dx$

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

$\frac{\tan 2x}{2} + C$

$$\int \cot^2(3x)\,dx = \int \csc^2 3x - 1 \; dx$$

$$\int \cancel{\frac{\cos^2 3x}{\sin^2 3x}}\, dx$$

$$-\frac{\cot 3x}{3} - x + C$$

$$\int \cos^3 x\,dx = \int \cos x \;\cos^2 x \; dx$$

$$\int \cos x\left(1-\sin^2 x\right)dx$$

$u = \sin x$
$du = \cos x\,dx$

$$\int (1-u^2)\,du$$

$$u - \frac{u^3}{3} + C$$

$$\sin x - \frac{\sin^3 x}{3} + C$$

Definite Integrals:

$$\int_0^{\frac{\pi}{3}} \tan x \sec^2(x)\,dx$$

$u = \tan x$
$du = \sec^2 x\,dx$

$$\int_0^{\sqrt{3}} u\,du$$

$$\left.\frac{u^2}{2}\right|_0^{\sqrt{3}} = \frac{3}{2} - 0 = \frac{3}{2}$$

$$\left.\frac{(\tan x)^2}{2}\right|_0^{\frac{\pi}{3}} = \frac{(\tan \frac{\pi}{3})^2}{2} - \frac{(\tan 0)^2}{2}$$

$$\frac{3}{2} - 0 = \frac{3}{2}$$

$$\int_0^1 \frac{x}{x^2-4}\,dx$$

$u = x^2 - 4$
$du = 2x\,dx$

$$\int_{-4}^{-3} \frac{\cancel{x}}{u}\,\frac{du}{2\cancel{x}}$$

$$\frac{1}{2}\int \frac{1}{u}\,du$$

$$\left.\frac{1}{2}\ln|u|\right|_{-4}^{-3} = \frac{1}{2}(\ln 3 - \ln 4)$$

$$\frac{1}{2}\ln\left(\frac{3}{4}\right)$$

$$\left.\frac{1}{2}\ln\left|x^2-4\right|\right|_0^1 = \frac{1}{2}(\ln 3 - \ln 4)$$

19.

$$\int \sec 2x \tan 2x \, dx \qquad u = 2x \qquad du = 2\,dx$$

$$\int \sec u \tan u \, \frac{du}{2}$$

$$\frac{1}{2}\int \sec u \tan u \, du$$

$$\frac{1}{2} \sec u + C$$

$$\frac{1}{2} \sec 2x + C$$

21.

$$\int \frac{dx}{x^2+9} \qquad 3\,u = \frac{x}{\cancel{3}} \qquad 3\,du = \frac{1}{\cancel{3}}\,dx$$

$$\int \frac{3\,du}{(3u)^2+9}$$

$$\int \frac{3\,du}{9u^2+9}$$

$$\int \frac{\cancel{3}\,du}{\cancel{9}^{\,3}(u^2+1)}$$

$$\frac{1}{3}\int \frac{1}{u^2+1}\,du$$

$$\frac{1}{3}\tan^{-1} u + C$$

$$\frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + C$$

37.

$$\int \frac{\sin(2t+1)}{\cos^2(2t+1)}\,dt$$

$u = \cos(2t+1)$

$\dfrac{du = -\sin(2t+1)2dt}{-2\sin(2t+1)}$

$$\int \frac{\cancel{\sin(2t+1)}}{u^2}\,\frac{du}{-2\cancel{\sin(2t+1)}}$$

$$-\frac{1}{2}\int \frac{1}{u^2}\,du \quad u^{-2}$$

$$+\frac{1}{2}\left(\frac{u^{-1}}{+1}\right)+C$$

$$\frac{1}{2\cos(2t+1)}+C$$

39.

$$\int \frac{dx}{x\ln x}$$

$u = \ln x$

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

$$\int \frac{1}{u}\,du$$

$$\ln u + C$$

$$\ln(\ln x) + C$$

47.

$$\int \sin^3 2x \, dx \qquad \sin^2 2x = \underline{1 - \cos^2 2x}$$

$$\sin 2x \cdot \sin^2 2x$$

$$\int \sin 2x \left(1 - \cos^2 2x\right) dx$$

$$u = \cos 2x$$

$$\frac{du}{-2\sin 2x} = \cancel{-2\sin 2x}\, dx$$

$$\int \cancel{\sin 2x}\left(1 - u^2\right) \frac{du}{-2\cancel{\sin 2x}}$$

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

$$-\frac{1}{2}\left(u - \frac{u^3}{3}\right) + C$$

$$\int \sin^3 2x \, dx = -\frac{1}{2}\left(\cos 2x - \frac{\cos^3 2x}{3}\right) + C$$