

$$15. \int_0^{\pi/4} \sec^2 t \, dt = [\tan t]_0^{\pi/4} = \tan \frac{\pi}{4} - \tan 0 = 1 - 0 = 1$$

$$18. \int_0^1 10^x \, dx = \left[\frac{10^x}{\ln 10} \right]_0^1 = \frac{10}{\ln 10} - \frac{1}{\ln 10} = \frac{9}{\ln 10}$$

$$20. \int_0^1 \frac{4}{t^2 + 1} \, dt = 4 \int_0^1 \frac{1}{1 + t^2} \, dt = 4[\tan^{-1} t]_0^1 = 4(\tan^{-1} 1 - \tan^{-1} 0) = 4\left(\frac{\pi}{4} - 0\right) = \pi$$

$$37. \frac{d}{dx} [\sqrt{x^2 + 1} + C] = \frac{d}{dx} [(x^2 + 1)^{1/2} + C] = \frac{1}{2}(x^2 + 1)^{-1/2} \cdot 2x = \frac{x}{\sqrt{x^2 + 1}}$$

$$43. \int \frac{\sin x}{1 - \sin^2 x} \, dx = \int \frac{\sin x}{\cos^2 x} \, dx = \int \frac{1}{\cos x} \cdot \frac{\sin x}{\cos x} \, dx = \int \sec x \tan x \, dx = \sec x + C$$

49. Since $r(t)$ is the rate at which oil leaks, we can write $r(t) = -V'(t)$, where $V(t)$ is the volume of oil at time t . [Note that the minus sign is needed because V is decreasing, so $V'(t)$ is negative, but $r(t)$ is positive.] Thus, by the Net Change Theorem,

$$\int_0^{120} r(t) \, dt = -\int_0^{120} V'(t) \, dt = -[V(120) - V(0)] = V(0) - V(120),$$

which is the number of gallons of oil that leaked from the tank in the first two hours (120 minutes).

54. The units for $a(x)$ are pounds per foot and the units for x are feet, so the units for da/dx are pounds per foot per foot, denoted (lb/ft)/ft. The unit of measurement for $\int_2^8 a(x) \, dx$ is the product of pounds per foot and feet; that is, pounds.