$$\frac{dy}{dx} = \frac{4\sqrt{y}\ln x}{x}$$

$$\int \frac{1}{\sqrt{y}} \frac{dy}{dx}\,dx = \int \frac{4\ln x}{x}\,dx$$

$$\int y^{-\frac{1}{2}}\,dy = 4\int \frac{\ln x}{x}\,dx$$

Let $u = \ln x$

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

$$2y^{\frac{1}{2}} = 4\int u\,du$$

$$2\sqrt{y} = 4\left(\frac{u^2}{2}\right) + C$$

$$2\sqrt{y} = 2(\ln x)^2 + C \qquad y(e) = 1$$

$$\sqrt{y} = (\ln x)^2 + C \qquad C = 0$$

$$y = (\ln x)^4$$

$$\frac{dP}{dt} = .001P(100-P)$$

$$\frac{dP}{dt} = \frac{.1}{100}P(100-P)$$

$$P = \frac{100}{1+Ae^{-.1t}}$$

$$\frac{dP}{dt} = \frac{k}{M}P(M-P)$$

$$P = \frac{M}{1+Ae^{-kt}}$$

$$\frac{dP}{dt} = .04P - .0004P^2$$

$$= \frac{k}{M} P(M - P)$$

$$= .0004P(100 - P)$$

$$= \frac{.04}{100} P(100 - P)$$