

$$\int 3x^2 dx$$

$$= 3x \int x dx \quad \text{NO!}$$

$$\int 3x dx = 3 \int x dx$$

$$\frac{d^2 y}{dx^2} = 2 - 6x$$

$$y(0) = 1$$

$$y'(0) = 4$$

$$\frac{dy}{dx} = 2x - 3x^2 + C$$

$$\frac{dy}{dx} = 2x - 3x^2 + 4$$

$$y = x^2 - x^3 + 4x + C$$

$$y = x^2 - x^3 + 4x + 1$$

$$\frac{dy}{dt} = \frac{1}{t+4} \quad y(-3) = 2$$

$$\int \frac{dy}{dt} dt = \int \frac{1}{t+4} dt$$

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

$\ln|u|$

$$\int 1 dy = \ln|t+4| + C$$

$$y = \ln|t+4| + C$$

$$2 = \ln|-3+4| + C$$

$$2 = \ln 1 + C$$

$$2 = C$$

$$y = \ln|t+4| + 2$$

$$\frac{dy}{dx} = (2x+1)(y+1) \quad y(-1) = 1$$

$$\int \frac{1}{y+1} \frac{dy}{dx} dx = \int 2x+1 dx$$

$$\int \frac{1}{y+1} dy = \int 2x+1 dx$$

$$\ln|y+1| = x^2+x+C$$

$$y+1 = \pm e^{x^2+x+C}$$

$$y = \pm e^{\frac{C}{x^2+x}} - 1$$

$$1 = \pm e^C - 1$$

$$2 = e^C$$

$$C = \ln 2$$

$$y = 2e^{x^2+x} - 1$$