

(24) $(x^2 + u)y' + 3xy = x, y(0) = 1$

$$u = (x^2 + u)$$

$$\frac{(x^2 + u)y'}{(x^2 + u)} + \frac{3xy}{(x^2 + u)} = \frac{x}{x^2 + u}$$

$$y' + \frac{3xy}{x^2 + u} = \frac{x}{x^2 + u}$$

$$u = x^2 + u$$

$$du = 2x dx$$

$$\frac{du}{2} = x dx$$

$$\int \frac{3x}{x^2 + u} dx \rightarrow 3 \int \frac{x}{x^2 + u}$$

$$3 \int \frac{\frac{du}{2}}{u} \rightarrow \frac{3}{2} \int \frac{du}{u} \rightarrow \frac{3}{2} \ln u$$

$$\frac{3}{2} \ln |x^2 + u|$$

$$(x^2 + u)^{3/2}$$

$$(x^2 + u)^{3/2} y' + \frac{3x(x^2 + u)^{3/2} y}{x^2 + u} = \frac{x}{(x^2 + u)^{1/2}}$$

$$(x^2 + u)^{3/2} y' + 3x(x^2 + u)^{1/2} y = \frac{x(x^2 + u)^{3/2}}{x^2 + u}$$

$$(x^2 + u)^{3/2} y' + 3x(x^2 + u)^{1/2} y = x(x^2 + u)^{1/2}$$

$$\frac{d}{dx} [(x^2 + u)^{3/2} y] = x(x^2 + u)^{1/2}$$

$$[(x^2 + u)^{3/2} y] = \int x(x^2 + u)^{1/2} dx$$

$$(x^2 + u)^{3/2} y = \int \frac{x(u)^{1/2} du}{2x}$$

$$(x^2 + u)^{3/2} y = \frac{1}{2} \frac{u^{3/2}}{3/2} + C$$

$$(x^2 + u)^{3/2} y = \frac{1}{3} (x^2 + u)^{3/2} + C$$

$$y = \frac{1}{3} + \frac{C}{(x^2 + u)^{3/2}}$$

$$\begin{aligned} u &= x^2 + 4 \\ du &= 2x dx \\ \frac{du}{2x} &= dx \end{aligned}$$

$$1 = \frac{1}{3} + \frac{C}{(u)^{3/2}}$$

$$\frac{2}{3} = C$$

$$\frac{2}{3} = \frac{C}{8}$$

$$\frac{16}{3} = C$$

$$y = \frac{1}{3} + \frac{16}{3(x^2+u)^{3/2}}$$