Section 31.4: cont'd

Tuesday, April 14, 2015
3:01 PM

useful property of logs:

$$e^{\ln x} = x$$

note: must be in <u>exactly</u> this form to use this property

$$e^{2\ln x} = e^{\ln x^2} = x^2$$

or: $(e^{\ln x})^2 = x^2$

$$e^{-\ln x} = e^{\ln \frac{1}{x}} = \frac{1}{x}$$

$$= \frac{1}{e^{\ln x}} = \frac{1}{x}$$

Solve: $xy' - 4y = x^5 e^{2x}$

give an explicit solution.

$$y' - \frac{4}{x} y = x^4 e^{2x}$$

linear with $P(x) = -\frac{4}{x}$

integrating factor: $e^{\int P(x)\,dx} = e^{\int -4/x\,dx}$

$$= e^{-4 \ln x}$$

$$= e^{\ln x^{-4}}$$

$$= x^{-4}$$

$$x^{-4} \frac{dy}{dx} - 4y x^{-5} = e^{2x}$$

$$\frac{d}{dx}\left(y x^{-4} \right) = e^{2x}$$

$$\int d\left(y x^{-4}\right) = \int e^{2x}\, dx$$

$$y x^{-4} = \frac{1}{2} e^{2x} + C$$

$$y = \frac{1}{2} x^{4} e^{2x} + C x^{4}$$