Differential Equations

Section 6.1

Differential Equation: AN EQUATION W DERIVETIVE (5)

Example: Show that the given function is a solution to the given equation.

$$y = e^{2x}$$

$$y' = e^{2x}$$

$$y'' = 4e^{2x}$$

$$y'' - 3y' + 2y = 0$$

$$4e^{2x} - 3 \cdot 2e^{2x} + 2 \cdot e^{2x} \stackrel{?}{=} 0$$

$$0 = 0$$



Solve the differential equation: Solve for



$$\frac{dy}{dx} = -4xy^{2} \quad f(0) = 1$$

$$\int \frac{dy}{dx} = \int -4x \, dx$$

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$$\int -4xy^{2}$$



Solve the differential equation: Solve for

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

$$y = \frac{1}{2} dy = \frac{1}{2} dx$$

$$1 - \frac{1}{2} dx$$

$$1 -$$



Solve the differential equation: Solve for

$$\frac{dy}{dx} = yx^{2} \quad y(0) = -3$$

$$\frac{dy}{dx} = x^{2} dx \quad \text{for all } 0 + C$$

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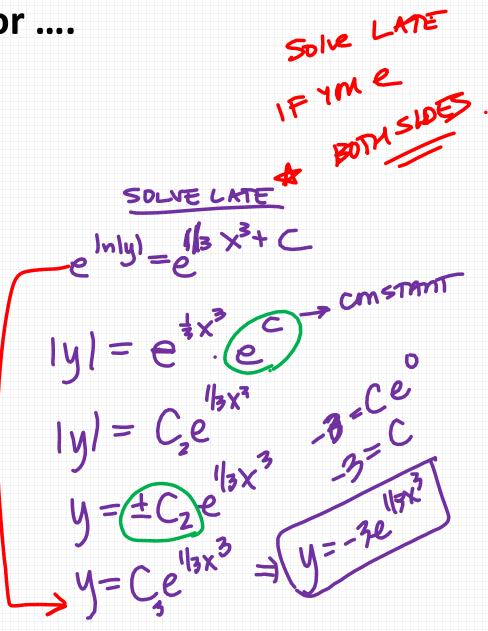
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$$\frac{dy}{dx} = x^{2} dx \quad \text{for all$$





Let f be a function with f(1)=4 such that for all points on the graph of f, the slope is given by $\frac{3x^2+1}{2y}$. $=\frac{4}{5}$

a. Find the slope of the graph of f at the point where x = 1.



Let f be a function with f(1)=4 such that for all points on the graph of f, the slope is given by $\frac{3x^2+1}{2y}$.

b. Write an equation for the line tangent to the graph of f at x = 1 and use it to approximate f(1.2).

$$2y - 4 = \frac{1}{2}(x - 1)$$

$$2y = 4 + 1/2(x - 1)$$

$$f(1.2) \approx 4 + \frac{1}{2}(1.2 - 1) = [4.1]$$



c. Find f(x) by solving the separable differential equation $\frac{dy}{dx} = \frac{3x^2+1}{2y}$ with the initial condition f(1) = 4.

$$2y dy = (3x^2+1) dx$$

 $y^2 = x^3 + x + C$
 $4^2 = 1^3 + 1 + C$
 $14 = C$



d. Use your solution from part c) to find f(1.2).

$$f(1.2) = \sqrt{(1.2)^3 + (1.2) + 14} = 4.114$$



Homework:

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