Quiz 2 Show your work
Feb 19, 2016 Circle your answer.

[10] 1.) Given that $y(x) = x^{\frac{3}{2}}$ and $y(x) = \frac{1}{x}$ are solutions to $2x^2y'' + xy' - 3y = 0$, state the general solution to this 2nd order homogeneous linear differential equation:

Given two linearly independent solutions to a 2nd order homogeneous linear differential equation, one can create the general solution by taking their linear combination. Thus the answer is

$$y(x) = c_1 x^{\frac{3}{2}} + \frac{c_2}{x}$$

In other words, $\{x^{\frac{3}{2}}, \frac{1}{x}\}$ forms a basis for the solution set (since every solution can be written uniquely as a linear combination of these two functions).

[10] 2.) Solve: $y' = y\ sin(x) + y$.

Separate variables: $\frac{dy}{dx} = y(sinx + 1)$.

$\frac{dy}{y} = (sinx + 1)dx$

$\int \frac{dy}{y} = \int (sinx + 1)dx$

$ln|y| = -cos(x) + x + C$

$ln|y| = -cos(x) + x + C$

$|y| = e^{-cos(x)+x+C} = e^C e^{x-cos(x)}$

Thus $y = Ce^{x-cos(x)}$

Answer: $y = Ce^{x-cos(x)}$