Name: Date: 4/25/2024

M20580 L.A. and D.E. Tutorial
Quiz 10

1. Consider the differential equation

$$y'' - y = 0.$$

Which of the following are solutions to the differential equation?

(a) x
(b) $\sin x + \cos x$
(c) $x + e^x$
(d) e^x
(e) $e^x + \sin x$

$\frac{d}{dx} e^x = e^x$ So $\frac{d^2}{dx^2} e^x - e^x = e^x - e^x = 0$

$\frac{d^2}{dx^2} e^x = e^x$ and e^x solves ODE

2. Find the general solution to

$$4y'' - y' = 0.$$

Auxiliary equation:

$4s^2 - s = 0$

$4s^2 - s = s(4s - 1)$

So $s = 0$ or $s = \frac{1}{4}$ are roots of auxiliary equation

This is a 2nd-order ODE so it has 2 fundamental solutions.
Our roots are both real and distinct, so they give fundamental solutions $y = e^{0x}$ and $y = e^{\frac{1}{4}x}$

hence the general solution is $y = c_1 + c_2 e^{\frac{x}{4}}$