Math 151 - Worksheet#08	Name (Print)	
Spring 2021	RedID	
	Section #/TA	

(P590 #1) 1. Show that $y = \frac{2}{3}e^x + Ae^{-2x}$ is a solution of the differential equation $y' + 2y = 2e^x$ for any value of A. Is this the only solution for this differential equation?

(P590 #3) 2. For what values of r does the function $y = e^{rx}$ satisfy the differential equation 2y'' + y' - y = 0? Is this the only solution for this differential equation? Explain/discuss!

(P605 #11) 3. Find (a) the general solution to the DE and (b) its particular solution satisfying the initial condition: $\frac{dy}{dx} = x e^y \text{ with } y(0) = 0$ (P605 #16) 4. Find (a) the general solution to the DE and (b) its particular solution satisfying the initial condition: $\frac{dP}{dt} = \sqrt{Pt} \quad \text{with} \quad P(1) = 2$

5. A population, P(t), behaves according to the differential equation

$$\frac{dP}{dt} = f(P) = (P-1)(P-3)(P-5)(P-8).$$

- (a) (i) What are the roots of f(P)?
 - (ii) Draw a sketch of f(P) as a function of P. Be sure to label the roots.

Hint: Think of the end behavior of f(P) (limits as $P \to \pm \infty$) to help sketch.

- (b) State the points and/or intervals where the population is
 - (i) constant:
 - (ii) increasing:
 - (iii) decreasing:
- (c) Draw (using arrows) on your sketch the direction in which the trajectories move of the *P*-axis.
- (d) What are the fixed points? What can you say about the stability of of the fixed points?
 - $P_1 =$ ____ is _____ $P_2 =$ ____ is _____ $P_3 =$ ____ is _____ $P_4 =$ ____ is _____
- (e) Sketch (i) the slope field and (ii) all qualitatively different solutions of f(P).