## Math 2340 Warm-Up Problems

1. What are the general solutions to the following differential equations:
(a) $y^{\prime}=7 y$
(b) $y^{\prime}+3 y=0$
(c) $8 y^{\prime}+4 y=0$
2. Consider the differential equation

$$
y^{\prime \prime}-7 y^{\prime}+12 y=0
$$

(a) Classify the differential equation.
(b) Verify that $y_{1}(x)=e^{3 x}$ and $y_{2}(x)=e^{4 x}$ are both solutions to the differential equation.
(c) Under what conditions is $y_{3}(x)=c_{1} e^{3 x}+c_{2} e^{4 x}$ also a solution to the differential equation?
3. Consider the differential equation

$$
r(x) y^{\prime \prime}+p(x) y^{\prime}+q(x) y=0 .
$$

(a) Classify the differential equation.
(b) Assume that $y_{1}(x)$ and $y_{2}(x)$ are both solutions to the above differential equation. Under what conditions is $y_{3}(x)=c_{1} y_{1}(x)+c_{2} y_{2}(x)$ also a solution?
(c) What do you think is special about the differential equation $r(x) y^{\prime \prime}+p(x) y^{\prime}+q(x) y=0$ that allows the above statement to be true.

