MATH 2340 WARM-UP PROBLEMS

1. What does it mean to find the "general solution" to an ODE?

2. **True or False** If $y' = f(x)g(y)$ (i.e. the differential equation is separable), then the solution in implicit form can by represented as
$$F(x) + G(y) = c$$
where $F(x)$ and $G(y)$ are two unknown functions to be determined such that $F(x)$ depends only on x and $G(y)$ depends only on y.

3. Determine which of the following differential equations are separable. If the ODE is separable, determine the general solution in implicit form.

   (a) $\left(x^2 + 1\right) y' = xy + \dfrac{x}{y}$

   (b) $x^2 + xy' = x$, where $x > 0$.

   (c) $\dfrac{dr}{dt} + 2t\, r = 2t$

   (d) $\dfrac{dr}{dt} + 2t\, r = 2$

4. If you did everything correctly, you should find that the only ODE that is not separable is # 2 (d). Let's figure out how to solve the ODE (but a more general version).