## Math 2080: Differential Equations Worksheet 2.5: Linear differential equations

## NAME:

1. For each of the first-order differential equations, decide whether it is linear or nonlinear. If the equation is linear, state whether it is homogeneous or inhomogeneous.
(a) $y^{\prime}=k y$
(b) $y^{\prime}=k(72-y)$
(c) $y^{\prime}=y(4-y)$
(d) $y^{\prime}=e^{y}$
(e) $3 y^{\prime}+5 y=3 \cos 2 t$
(f) $3 y^{\prime}+5 y=3 \cos 2 y$
(g) $y^{\prime}=4 t^{2} y-\sin t$
(h) $y^{\prime}=4 t y^{2}-\sin t$
2. Find the general solution to $y^{\prime}-2 y=5 e^{3 t}$ by first solving (in your head) the related homogeneous equation, and then looking for a particular solution of the form $y_{p}(t)=a e^{3 t}$.
3. Find the general solution to $y^{\prime}-2 y=t$ by first solving the related homogeneous equation, and then looking for a particular solution of the form $y_{p}(t)=a t+b$.
