## MATH 246 Groupwork 0.1

Name: $\qquad$

1. For each of the following check if the function given is or is not a solution to the differential equation given.
(a) Is $y=2 x^{2}+1$ a solution to $y-\frac{1}{2} x y^{\prime}=1$ ?
(b) Is $f(t)=\sin (3 t)$ a solution to $9 f(t)+f^{\prime \prime}(t)=0 \quad$ ?
(c) Is $y=\frac{1}{t}$ a solution to $y^{\prime}=y^{2} \quad$ ?
(d) Is $y=\sqrt{t}$ a solution to $y y^{\prime}=\frac{1}{2} \quad$ ?
2. The following differential equations have a solution that you can get by using prior knowledge and a little trial-and-error. Find a solution to each. You don't need to show how you found your solution, just show that it works.
(a) $y^{\prime}=y$ (Hint: What function do you know which equals its own derivative?)
(b) $f^{\prime \prime}(t)=-f(t)$
(c) $f^{\prime}(t)=3$ (Hint: The answer is obvious. What may not be obvious is that this is in fact a differential equation!)
3. Give the order of each of the following differential equations.
(a) $t^{3} y^{\prime}+\left(y^{\prime \prime}\right)^{2}=3 y+1$
(b) $y^{\prime \prime}=3 t+1$
(c) $f^{(5)}(t)+f^{\prime \prime}(t)=t^{2}+t+f(t)-1$
4. Determine whether each of the following differential equations is linear. If not explain what is not permitted.
(a) $t y^{\prime}+t^{2} y=\sin t$
(b) $y y^{\prime}+t^{2} y=e^{t}$
(c) $t e^{y}+y^{\prime}=2 t+1$
(d) $\sin (t) y^{\prime \prime}-\frac{1}{t} y^{\prime}=y+1$
