The problems on this worksheet are for in-class practice during tutorial. You are free to collaborate and to ask for help. They don't count for course credit, but it's a good idea to make sure you know how to do everything before you leave tutorial – similar problems may show up on a test or assignment.

1. Solve the following separable differential equations:
   (a) $xy' = y + 2x^2y$, where $y(1) = 1$.
   (b) $\dfrac{dy}{dx} = \dfrac{x^2+1}{y^2+1}$, where $y(0) = 1$. (Give an implicit solution.)
   (c) $(4y + yx^2)\,dy - (2x + xy^2)\,dx = 0$
2. Solve the following linear differential equations. State an interval on which the general solution is defined.
   (a) $\dfrac{dy}{dx} + y = e^{3x}$
   (b) $(1 + x^2)\,dy + (xy + x^3 + x)\,dx = 0$
   (c) $(1 - x^3)\dfrac{dy}{dx} = 3x^2y$
   (d) $(x^2 + x)\,dy + (xy + x^3 + x)\,dx = 0$
   (e) $\cos x\dfrac{dy}{dx} + y\sin x = 1$
3. Determine whether the sequence converges or diverges. If it converges, give the limit.
   (a) $a_n = (-1)^n\dfrac{n}{n^2+1}$
   (b) $a_n = (-1)^n\dfrac{2n+1}{3n+4}$
   (c) $a_n = \dfrac{n-1}{n} - \dfrac{n}{n-1}$
   (d) $a_n = \dfrac{4n}{\sqrt{9n^2+4}}$
   (e) $a_n = 1 - \dfrac{1}{n}$
   (f) The sequence $\{a_n\}$ defined by $a_1 = 1$ and $a_{n+1} = 3 - \dfrac{1}{a_n}$ for all $n \geq 1$. (You may assume that the sequence converges. If you want to actually *show* that it coverges, feel free to ask me how.
   (g) The sequence $\{a_n\}$ defined by $a_1 = \sqrt{2}$ and $a_{n+1} = \sqrt{2 + a_n}$ for all $n \geq 1$. (Again, you may assume that the sequence converges.)