MA2327, Homework #1

due Thursday, Oct. 13 or Oct. 20

- 1. Solve the separable equation $y'(x) = xe^{y(x)-x}$.
- **2.** Suppose that $y_0 > 0$ and consider the initial value problem

$$y'(x) = y(x)^3 - y(x), \qquad y(0) = y_0.$$

For which values of the constant $y_0 > 0$ is the corresponding solution global?

- **3.** Solve the first-order linear equation $xy'(x) y(x) = x^3 \sin x$, where x > 0.
- 4. Determine the nonzero solutions of the Bernoulli equation

$$y'(x) + y(x) = xe^{2x}y(x)^3, \qquad y(0) = y_0.$$

On which interval is the solution defined in the case that y_0 is nonzero?