# MA 2326
# Assignment 2
# Due 3 February 2015

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1. Solve the initial value problem

$$y'(x) = \frac{2}{x} y(x) + 1$$

$$y(x_0) = y_0$$

where $x_0 \neq 0$.

2. Show that every linear inhomogeneous equation

$$y'(x) = a(x)y(x) + b(x)$$

possesses an integrating factor which is a function of $x$ alone:

$$\mu(x, y) = h(x).$$

3. Given that

$$y(x) = x^5 - 3x^4 + 5x^3 - 7x^2 + 6x - 2$$

is a solution of the differential equation

$$y'(x) - y(x) + x^5 - 8x^4 + 17x^3 - 22x^2 + 20x - 8 = 0$$

find a solution with $y(0) = y_0$.

4. Use the integrating factor from Problem 2 to solve the initial value problem

$$y'(x) = a(x)y(x) + b(x),$$
$$y(x_0) = y_0$$

using the method given in lecture for integrable equations.
*Note:* We know already that the solution to the initial value problem is unique, so if your final answer isn't

$$y(x) = y_0 \exp\left(\int_{x_0}^{x} a(t)\,dt\right) + \int_{x_0}^{x} \exp\left(\int_{s}^{x} a(t)\,dt\right) b(s)\,ds$$

then you've done something wrong.