# LaTeX Assignment 1

May 17, 2011

Create a new LaTeX file with the name `username.tex` (where *username* is your Mines Email ID) containing at first, the commands

`\documentclass[letterpaper,12pt]{article}`, `\begin{document}`, and `\end{document}`.

Also, within the preample of your document include the command

```
\usepackage[top=2.5cm, bottom=2.5cm, left=2cm, right=2cm]{geometry}
```

Reproduce each of the following within your .tex file (you need only reproduce items 1 - 4, including numbering, but not the surrounding directions and hints):

1. The derivative of the indirect function $f[g(x)]$ is $\{f[g(x)]\}' = f[g(x)]g'(x)$. For the second derivative of the product of $f(x)$ and $g(x)$ one has $[f(x)g(x)]'' = f''(x)g(x) + 2f'(x)g'(x) + f(x)g''(x)$.
2. The reduced cubic equation $y^3+3py+2q = 0$ has one real and two complex solutions when $D = q^2+p^3 > 0$. These are given by Cardan's formula as
$$y_1 = u + v,\ y_2 = -\frac{u+v}{2} + \frac{\mathrm{i}}{2}\sqrt{3}(u-v),\ y_3 = -\frac{u+v}{2} - \frac{\mathrm{i}}{2}\sqrt{3}(u-v)$$
where
$$u = \sqrt[3]{-q + \sqrt{q^2+p^3}},\ v = \sqrt[3]{-q - \sqrt{q^2+p^3}}$$
3. Each of the measurements $x_1 < x_2 < \cdots < x_r$ occurs $p_1, p_2, \ldots, p_r$ times. The mean value and standard deviation are then
$$x = \frac{1}{n}\sum_{i=1}^{r} p_i x_i, \quad s = \sqrt{\frac{1}{n}\sum_{i=1}^{r} p_i (x_i - x)^2}$$
where $n = p_1 + p_2 + \cdots + p_r$.
4. Although this equation looks very complicated, it should not present any great difficulties:
$$\int \frac{\sqrt{(ax+b)^3}}{x}\mathrm{d}x = \frac{2\sqrt{(ax+b)^3}}{3} + 2b\sqrt{ax+b} + b^2 \int \frac{\mathrm{d}x}{x\sqrt{ax+b}}$$
The same applies to $\int_{-1}^{8}(\mathrm{d}x/\sqrt[3]{x}) = \frac{3}{2}(8^{2/3} + 1^{2/3}) = 15/2$.

Some hints on these

1. Higher derivatives are made with multiple ' symbols: `$y'''$` yields $y'''$.
2. Use `\mathrm{i}` to denote $\sqrt{-1}$
3. Use `\mathrm{d}x` to denote $\mathrm{d}x$
4. Using your favorite online search engine, investigate the LaTeX commands: `int`, `ldots`, `\cdots`, `sqrt`, and `frac`
5. You may want to try the last one in small chunks of LaTeX rather than trying to typeset all at once.