Homework 1 - Math 141, Frank Thorne (thornef@mailbox.sc.edu)
Due Monday, August 31.

**Important:** As with everything else in life, being right is not enough. Please show your work, write in complete sentences, and explain your reasoning clearly.

**Required problems.**

(a) Thomas, Ch. 1.1, 7, 10, 25.

(b) What is a function? (This is the most important question in all of mathematics.)

(c) Thomas, Ch. 1.2, 6, 23, 55.

(d) Simplify $\frac{1}{x+1} - \frac{1}{x}$.

(e) Simplify $(abc)^{10}(a^5b^3d^{-2})^{-2}$.

(f) Simplify $\frac{1}{\frac{1}{x} - \frac{1}{h}}$.

(g) Simplify $\frac{(x+h)^2-x^2}{h}$.

(h) Simplify $\frac{(xy)^2}{(x^2y)^2}$.

(i) Simplify $(x+2)(x+3) + (x+2)(x-3)$.

(j) Simplify $(x+1)^2(x+2)^3 + (x+1)^3(x+2)^2$.

(k) Factor $x^2 - a^2$.

(l) Factor $x^3 - a^3$.

(m) Factor $x^3 + a^3$.

(n) Define the trigonometric functions $\sin(x)$, $\cos(x)$, $\tan(x)$, $\sec(x)$, $\csc(x)$, and $\cot(x)$.

(o) Draw the unit circle and indicate the following angles on it: $0, \pi/6, \pi/4, \pi/3, \pi/2, 2\pi/3, 3\pi/4, 5\pi/6, \pi, 7\pi/6, 5\pi/4, 4\pi/3, 3\pi/2, 5\pi/3, 7\pi/4, 11\pi/6$. For each angle, compute $\sin(x)$, $\cos(x)$, $\tan(x)$, $\cot(x)$, $\csc(x)$, and $\sec(x)$.

(p) Define the exponential and logarithmic functions $e^x$ and $\ln x$.

(q) Thomas, Ch. 1.5, 3, 7, 11-12.

(r) Define the term *inverse function*. Give an example of a function that has an inverse, and of a function that does not.

(s) Thomas, Ch. 1.6, 19, 20, 25, 26.

**Additional problems.**

(a) Ch. 1.1, 15-18, 26-28; Ch. 1.2, 5, 24, 56; Ch. 1.5, 5, 24, 35-44; Ch. 1.6, 21, 22, 27, 28.