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

Due Friday, 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) Stewart, Ch. 1.1, 1, 5-6, 12, 13.

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

(c) Stewart, Ch. 1.2, 10, 16.

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

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

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

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

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

(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) Determine (with a brief explanation) the values of each of the trigonometric functions above for $x = \pi/3$ and $x = 3\pi/4$.

(p) Stewart, Ch. 1.3, 11-14 (**show your work**), 31, 32, 53, 56.

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

(r) Stewart, Ch. 1.5, 9-10.

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

(t) Define the logarithmic functions $\log_a(x)$ and $\ln(x)$.

(u) Stewart, Ch. 1.6, 18 (in addition, graph the inverse of f), 21-24, 47-50.

Additional problems.

(a) Stewart, Ch. 1.3, 15-16.

(b) Stewart, Ch. 1.5, 11, 12.

(c) Stewart. Ch. 1.6, 5, 6, 20, 50, 52, 53.

Bonus (1 point).

(a) Simplify the expression
$$(x - a)(x - b)(x - c) \cdots (x - z).$$