

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

**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  $\frac{\frac{1}{x+h} - \frac{1}{x}}{h}$ .
- (g) Simplify  $\frac{(x+h)^2 - x^2}{h}$ .
- (h) Simplify  $\frac{(xy^2)^2}{(x^2y)^2}$ .
- (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.