

Homework 5 - Math 141, Frank Thorne (thornef@mailbox.sc.edu)

Due Friday, October 5

- (a) Explain why $\frac{d}{dx}(\sin x) = \cos x$ and $\frac{d}{dx}(\cos x) = -\sin x$.
- (b) Find $\frac{df}{dx}$ for the functions $f(x) = \tan x$, $f(x) = \cot x$, $f(x) = \sec x$, and $f(x) = \csc x$.
- (c) Find the 4th, 7th, 23rd, and 4000001th derivatives of $\sin x$ and $\cos x$.
- (d) Explain why $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$.
- (e) Stewart, Ch. 3.3, 3-10, 21-22 (even).
- (f) Stewart, Ch. 3.3, 31, 35.
- (g) Stewart, Ch. 3.3, 49.
- (h) Explain why $\lim_{x \rightarrow 0} \frac{\cos x - 1}{x} = 0$. (You can use the fact that $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$.)
- (i) What is the chain rule?
- (j) Stewart, Ch. 3.4, 8, 14, 18, 20, 22, 26, 30, 34, 48, 50, 54, 60.
- (k) What is the relation between $\frac{dy}{dx}$ and $\frac{dx}{dy}$?
- (l) Find $\frac{dy}{dx}$ if $x^2 + y^2 = 1$. First, answer in terms of both x and y , and then give an answer only in terms of x .
- (m) Stewart, Ch. 3.5, 1-4.
- (n) Find $\frac{dy}{dx}$ if (a) $y = \sin^{-1} x$, and (b) $y = \tan^{-1} x$.
- (o) Stewart, Ch. 3.5, 7-18 (even).
- (p) Stewart, Ch. 3.5, 27-30, 43.

Additional problems:

- (a) Stewart, Ch. 3.3, 3-14, 21-24 (odd).
- (b) Stewart, Ch. 3.4, 7, 13, 17, 19, 21, 25, 29, 33, 47, 49, 53, 59.
- (c) Stewart, Ch. 3.5, 7-18 (odd).

Bonus (1 point each): Stewart, Ch. 3.5, 59, 69.