Math 131 Day 1 Hand In. Name: Answers

Warm up exercises. Work neatly and in pencil.

1. State the Mean Value Theorem (MVT) and draw a picture (different than the one in the text) which illustrates its meaning. Note: the MVT is the single most important theorem in Calculus I and we will use it again this term.

The Mean Value Theorem: Assume that

1. f is continuous on the closed interval $[a, b]$;
2. f is differentiable on the open interval (a, b).

Then there is some point c between a and b so that

$$f'(c) = \frac{f(b) - f(a)}{b - a}.$$

This is equivalent to saying $f(b) - f(a) = f'(c)(b - a)$.

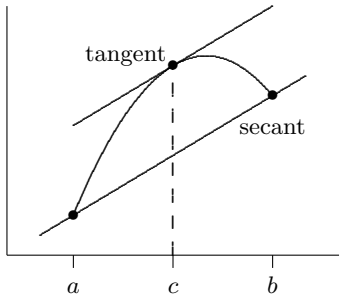

Figure 1: Parallel secant and tangent lines exist when the Mean Value Theorem applies.

2. State the **derivatives** of the following functions. Review if necessary.

a) $f(x) = 2\cos x + \arcsin x$; $\quad f'(x) = -2\sin x + \dfrac{1}{\sqrt{1 - x^2}}$

b) $h(t) = t^2 \tan t$; $\quad h'(t) = 2t\tan t + t^2 \sec^2 t$

3. Determine these **antiderivatives**.

a) $\displaystyle\int \sin x + 2\sec x \tan x \, dx = -\tfrac{1}{3}\cos x + 2\sec x + c$

b) $\displaystyle\int \sqrt{x} - 4e^x + 1 \, dx = \tfrac{2}{3}x^{3/2} - 4e^x + x + c$

4. $\displaystyle\lim_{x\to 0} \frac{e^x - 1}{\ln(x+1)} \overset{\text{l'Ho}}{=} \lim_{x\to 0} \frac{e^x}{\frac{1}{x+1}} = \frac{e^0}{1} = 1.$