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/m170.sp08/handouts170/t1_170_227/REVSTUFF/review_suggestions_1.tex

1 This list is not in final form. Like, stuff may yet be added to it.

2 Test #1 is

Wednesday
2/27/08.

3 The test will cover the material of Assignments #1 – # 13, at least, roughly, that is,

sections 2.1- 3.2 and _____.

You'll need to have a working graphing calculator for a narrow-window plot of some difference quotient. The calculator part of the test will be handed out first (on colored paper).

When you are finished with it, put your calculator away and raise your hand. I will rush over to you and swap for the main, non-calculator, portion of the test.

4 Topic List

(i) A limit may exist in the sense of the page-75 definition, eg,

$$\lim_{\theta\to 0}\frac{\sin(3\theta)}{\theta} = 3.$$

A limit may fail to exist:

$$\lim_{x\to\infty}\cos(x) \qquad \text{or} \qquad \lim_{x\to\infty} x^2\cos(x).$$

Some non-exisitent limits fail to exist in a relatively nice fashion: let

$$f(x) = x^{-1/3} - (x-1)^{-4/3},$$

then

$$\begin{aligned}\lim_{x\to 0+} f(x) &= +\infty\\ \lim_{x\to 0-} f(x) &= -\infty\\ \lim_{x\to 1+} f(x) &= -\infty\\ \lim_{x\to 1-} f(x) &= -\infty\end{aligned}$$

(ii) The limit definition of the derivative, which is the power behind all our short-cut derivative-finding formulas. In self defense, one must read the problem to decide whether the question is asking for use of the limit definition or the section-3.2 short-cuts.

(iii) If $f(x) = C$, where C is a constant (such as 8, $\ln(5280)$, or $\pi^{3/2}$), then $f'(x) =$?

(iv) If $f(x) = A\,u(x) + B\,w(x) + C\,w(x) + D$, then $f'(x) =$?

(v) The text tells us to apply the Power Rule, not just to positive-integer powers, but also to exotic powers such as x^{-3}, $x^{2/3}$, $x^{-\pi/2}$.

(vi) If $R(x) = \dfrac{1}{v(x)}$, then $R'(x) =$ ____________

(vii) If $P(x) = u(x)v(x)$, then $P'(x) =$ ____________

(viii) If $Q(x) = \dfrac{u(x)}{v(x)}$, then $Q'(x) =$ ____________

5 Suggested Problems

(i) Let $q(x) = \dfrac{1}{\sqrt[3]{x}}$. Without resort to calculating machinery, find an equation for the line tangent to the graph of q at the point of its graph with x-coordinate 64.

(ii) Let $f(x) = 2x^{3/2} + 18x^{1/2} + 60x^{-1/2}$.

- (a) Compute $f'(x)$. Simplify.
- (b) Determine points of tangency and equations for horizontal lines tangent to the graph of f.

(iii) Let $f(x) = \dfrac{9x^2 - 72x + 143}{x^2 - 8x + 16}$.

- (a) Use long division to rewrite the formula for f in a simpler form.
- (b) Use the simpler form to write down equation(s) for horizontal asymptote(s) of the graph of f.
- (c) Use the simpler form to sketch the "horizontal-asymptote(s) cosy", that is, how the graph of f relates to the graph of a horizontal asymptote for $|x| >>> 0$.

(d) Use the simpler form to write down equation(s) for vertical asymptote(s) of the graph of f.

(e) Use the simpler form to sketch "vertical-asymptote cosy" for each vertical asymptote.

(f) Use the simpler form to calculate f' using our section-3.2 shortcut rules. Simplify.

(g) Determine points of tangency and equations for horizontal lines tangent to the graph of f.

(h) For f on the interval $[0, 2]$, find the maximum and minimum point (both coordinates) for f.

(iv) Let $g(x) = (x - 2)e^x$. The following are no-calculator problems.

(a) Compute $g'(x)$ and $g''(x)$. Simplify.

(b) Determine points of tangency and equations for horizontal lines tangent to the graph of g.

(v) Let $H(x) = \sqrt[3]{x}\ln(x)$. The following are no-calculator problems.

(a) Compute $H'(x)$. Simplify.

(b) Determine points of tangency and equations for horizontal lines tangent to the graph of H.

(vi) Let $f(x) = \dfrac{1 + \ln(x)}{1 - ln(x)}$. The following are no-calculator problems.

(a) Give the domain of f.

(b) Write down equation(s) for horizontal asymptote(s) of the graph of f.

(c) Compute $f'(x)$. Simplify.

(d) Determine points of tangency and equations for horizontal lines tangent to the graph of f.

(vii) Be prepared to write a simple $\varepsilon - \delta$ proof of a limit of a simple function.

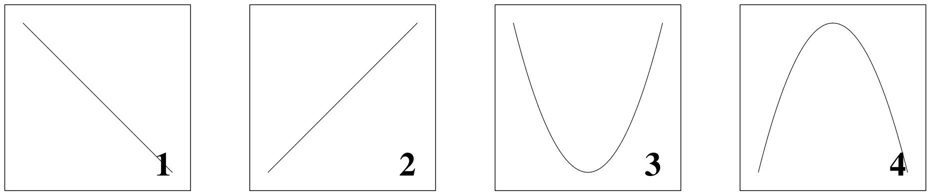
6 Comments on Old Tests

(i) **MATH 170 030 Test #1 for 6/16/05:** Problems 1 and 2 won't appear on our test. They test for algebra skills that will be important in chapter 4. Problems 3-8 could appear on our test. Problem 10, parts (a)-(e) and (i) could appear on our test.

(ii) **MATH 170 031 Test #1 for 6/16/05:** The same problem numbers as for the section-030 test.

(iii) **MATH 170 006 Test #1 for 2/11/05:** All the problems could appear on our test, except for 10 (h)-(j)

7 The following numbered graphs are "narrow-window" graphs of difference quotients such as might be displayed by a TI-83.



For each of the following function-point pairs, fill the blank with the best corresponding narrow-window graph of the difference quotient for the derivative of the given function at the given point.

(a) ____ $f(x) = \sqrt{x}$ $\qquad x = 2$

(b) ____ $f(x) = x^2 - 4x + 13$ $\qquad x = 2$

(c) ____ $f(x) = \ln(x)$ $\qquad x = 2$

(d) ____ $f(x) = \sin(x)$ $\qquad x = \pi/3$

(e) ____ $f(x) = \sin(x)$ $\qquad x = -\pi/3$

(f) ____ $f(x) = \cos(x)$ $\qquad x = \pi$