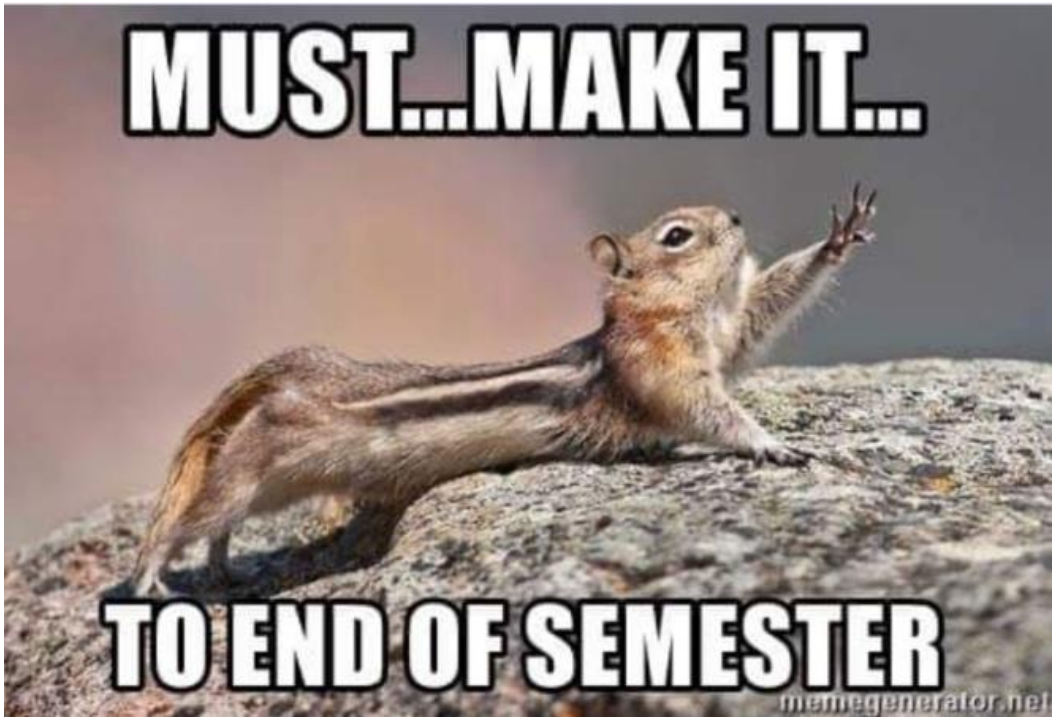
REVIEW SHEET FOR FINAL EXAM: MATH 161



Study: Chapters 1 – 5 and section 6.1 (excluding section 2.4) of Stewart.

1. Understanding graphs

A. precalculus strategy (domain, zeroes, singularities, sign analysis, limiting behavior, symmetry)

B. regions of increase and decrease (first derivative test for local extrema)

C. concavity and points of inflection

D. second derivative test for local extrema

E. Graphing functions of the form $g(x) = \int_a^x f(t)dt$

F. geometric differentiation

G. geometric anti-differentiating

2. Differential Calculus

A. limit definition of the derivative

B. finding tangent and normal lines

C. continuity

D. differentiation rules including sum, product, and quotient

E. chain Rule

F. meaning of the derivative as rate of change

G. higher-order derivatives

H. l'Hôpital's rule

I. linearization: estimating numerical values using a tangent line

J. related rate problems

K. optimization problems

L. Newton's method

3. Definition and meaning of the definite (Riemann) integral.

A. area between curves

B. distance, velocity, acceleration problems

C. limit of a Riemann sum equals a definite integral

D. average value of a function

E. properties of the indefinite and the definite integral

F. Fundamental Theorem of Calculus! *(both versions)*

G. Net Change Theorem

H. Leibniz's extension of FTC for differentiation of an integral

I. implicit and logarithmic differentiation

J. differential equations; initial value problems

4. Techniques of integration

A. judicious guessing

B. substitution (for both indefinite and definite integrals) *aka* change of variable theorem

C. use of symmetry in evaluating definite integrals (odd functions, even functions)

D. verifying an integration formula by means of differentiation

5. Logs and exponential functions

A. log and exp as inverse functions of one another

B. properties of logs and exponentials: $\log(ab)$, $\log(a/b)$, $\log(a^p)$, $\exp(a + b)$, etc.; change of base formula for logs

C. differentiating and integrating function of the form b^x

D. differentiating functions of the form $f(x)^{g(x)}$

6. Statements of Theorems

A. Sandwich (aka Squeeze)Theorem

B. limit as $\theta \to 0$ of $(\sin \theta) / \theta$

C. Intermediate Value Theorem

D. Extreme Value Theorem

E. Rolle's Theorem

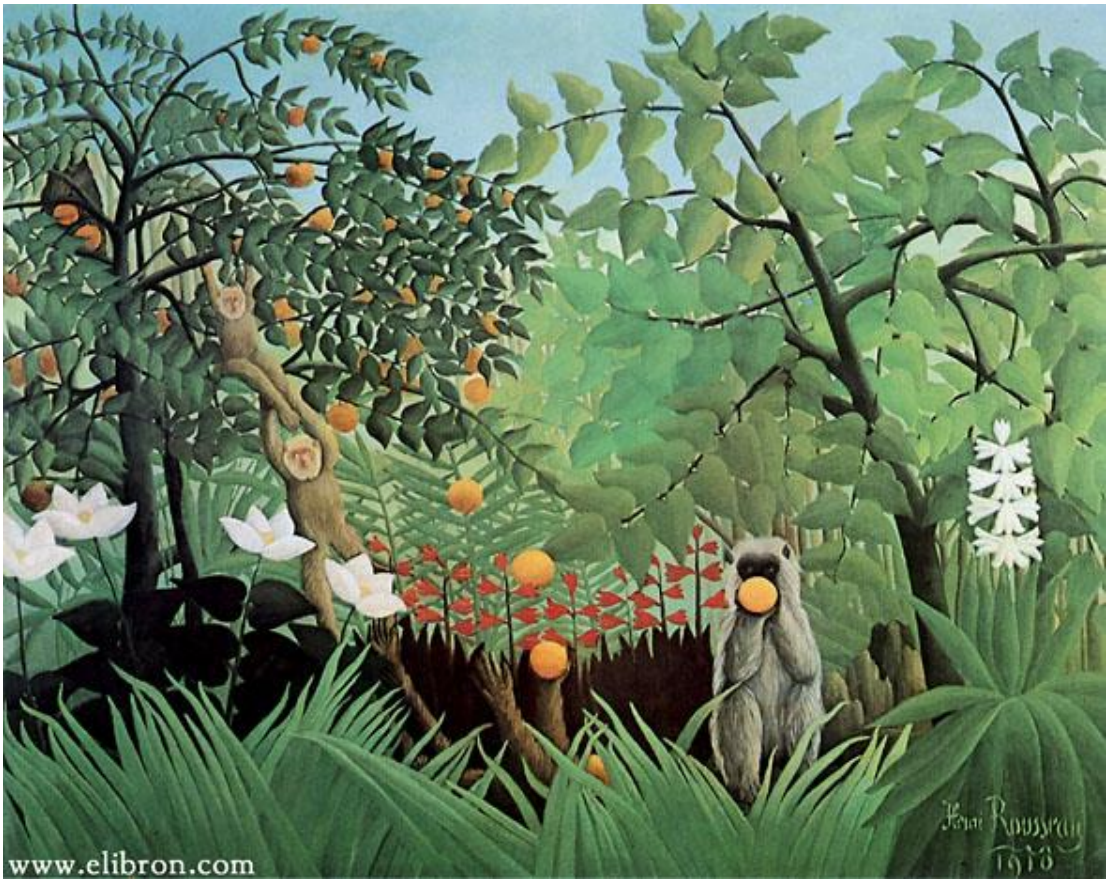
F. Mean Value Theorem and its Corollaries

G. Fundamental Theorem of Calculus *(both versions)*

H. Net Change Theorem

Examinations are formidable even to the best prepared, for the greatest fool may ask more than the wisest man can answer.

- C. C. Colton, **Lacon**



Henri Rousseau. **Exotic Landscape**. (1910)