Review III

1. Section 3.6
   a. Explicit vs implicit equations
   b. Implicit differentiation
      i. Tangent line slope
   c. Derivatives of inverse functions
      i. Inverse trig functions
   d. Logarithmic differentiation
   e. Derivative of exponential functions
   f. Representative problems: 4, 5, 21, 31, 34, 37, 40, 43, 51, 55

2. Section 3.7
   a. General procedure for related rates problems
   b. Representative problems: 14, 17, 22, 24, 26, 27, 32, 34, 42

3. Section 3.8
   a. Tangent line approximation to $y = f(x)$
   b. Linearization of a function $y = f(x)$ at point $x = x_0$
   c. Differential of $y = f(x)$
   d. Rules for differentials
   e. Estimating error propagation via differentials
   f. Newton's method for root approximation
   g. Representative problems: 5, 10, 14, 19, 23, 31, 42, 46

4. Section 4.1
   a. Absolute max and min on closed bounded interval
   b. Relative max and min
   c. Critical points f: where $f'(c) = 0$ or $f'(c)$ does not exist
   d. Theorem 4.2: If f has a relative extrema at c, then c is a critical point of f
   e. Procedure for finding absolute extrema
   f. Optimization (applications of finding extrema to problems)
   g. Representative problems: 3, 6, 13, 18, 22, 30, 37, 41, 52

5. Section 4.2
   a. Mean Value Theorem
   b. Rolle's Theorem
   c. Zero Derivative Theorem: If $f'(x) = 0$ for all x, then $f(x) =$ constant
   d. Constant Difference Theorem: If $f'(x) = g'(x)$ for all x, then $f(x) = g(x) +$ constant
   e. Representative problems: 4, 10, 24, 27, 31

6. Section 4.3
   a. Graph of a function $y = f(x)$ increasing (decreasing) on an interval (a,b)
   b. Monotone Function Theorem: If $f'(x) > 0$ on (a,b), then $y = f(x)$ is increasing on (a,b)
   c. First-derivative test for relative extrema
   d. Procedure (first-derivative) for sketching the graph of $y = f(x)$
   e. Representative problems: 3, 4, 13, 18, 19, 24, 34, 46-48

7. Section 4.4
   a. Graph of a function $y = f(x)$ concave up (concave down) on an interval (a,b)
   b. Inflection point: Point on the graph across which there is a change in concavity
   c. Second order critical points of a function $y = f(x)$
   d. Second-derivative test for relative extrema
   e. Procedure (using first- and second-derivative information) for sketching the graph of $y = f(x)$
   f. Representative problems: 6, 9, 15, 18, 22, 30, 39-41

8. Section 4.5
   a. Limits to infinity: $\lim_{x \to \infty} f(x) = L$
      i. $\lim_{x \to \infty} \frac{1}{x} = 0$
   b. Algebra of limits
   c. Infinite limits: $\lim_{x \to c} f(x) = \infty$
   d. Asymptotes
      i. Vertical
      ii. Horizontal
      iii. Slant (Oblique)
   e. Curve sketching (Procedure Outlined in Table 4.2)
   f. Representative problems: 5, 8, 11, 14, 19, 23, 27, 29, 39, 43

9. Section 4.6
   a. Optimization procedure (Page 273)
   b. Geometry, physical sciences, engineering problems
   c. Representative problems: 3, 6, 8, 13, 16, 20, 21, 26

10. Section 4.7
   a. Business, economics, life sciences problems
      i. Maximum profit
      ii. Inventory problems
   b. Representative problems: 1, 5, 6, 9, 14, 21, 23, 25, 30, 32

11. Section 4.8
   a. Indeterminant forms: $\frac{0}{0}$, $\frac{\infty}{\infty}$
   b. l'Hôpital's rule
   c. Other indeterminant forms: $0 \cdot \infty$, $\infty - \infty$, 0^0, 1^∞
   d. Representative problems: 3, 7, 8 12, 16, 28, 32, 37, 38, 45, 49

12. Section 5.1
   a. Anti-derivatives: reversing differentiation
   b. Anti-derivatives for the same function differ by a constant
   c. (Indefinite) integral notation: $\int f(x)\,dx = F(x) + C$
   d. Anti-differentiation formulas
      i. Linearity of anti-differentiation
   e. Representative problems: 5, 12, 15, 18, 22, 23, 28, 29, 41