Multiple Choice

1. Find derivative using product rule or quotient rule.
2. Find secant line or tangent line.
3. Given functions, find instantaneous rates of change.
4. Given a piecewise function, find derivative and determine continuity.

5, 6. Given a power function \( f(x) = cx^n \), \( n \) a real \( \neq \), determine at \( a \)
   - the derivative \( f'(a) \), one-sided derivatives \( f'_+(a) \) or \( f'_-(a) \), and
   - limits of derivatives, \( \lim_{x \to a^+} f'(x) \), \( \lim_{x \to a^-} f'(x) \), \( \lim_{x \to a} f'(x) \).

   Distinguish cases \( n < 0 \), \( 0 < n < 1 \), \( n = 1 \), and \( 1 < n \).

7. Given rational function \( f(x) = \frac{(x-a)^n(x-b)^m}{(x-a)^p(x-c)^q} \), determine
   - \( x \)-intercepts, vertical asymptotes, end behavior, \( y \)-intercepts, and holes. Consider cases \( n > p \), \( n = p \), \( n < p \).

8. Given an interval and partition \#s, find left-hand endpoints, right-hand endpoints, and midpoints.

9. Given a quadratic function with variable coefficients,
   \( f(x) = ax^2 + bx + c \), and given conditions on \( a, b, c \), determine sign of \( f(x) \),
   increase/decrease of \( f \), and concavity of \( f \).

10. Relate a function acting across an inequality to whether the function increases or decreases.

11. Find the limit as \( n \to \infty \) of a rational expression like the ones

   found in 5.3 problems 25-30.

   Other E. Optimization 4.6 problems 1 thru 24.

12. Apply Chain Rule to find derivative of function like 5.6 problem 7 thru 62.

13. Given a piecewise function, determine reason it is not continuous. Knowledge of removable, jump, infinite, and oscillatory discontinuities. Relate to one-sided limits of \( f \) and one-sided derivatives of \( f \) (Chapters 2, 3).

14. Given a region, sketch it, and set up integrals to find volume of region rotated about an axis using disks/washers or cylindrical shells. Do not evaluate.

15. Evaluate integrals using algebra or substitution (5.2 or 5.6).

16. Apply Sandwich Theorem.

17. Find limit of an algebraic function (5.4).

18. (3.7) Given an equation in \( x \) and \( y \), use implicit differentiation to find \( \frac{dy}{dx} \). Find the equation of a line tangent to the graph of the equation at a point. Use differentials to approximate \( dy \) given \( \Delta x \).

19. Apply error formula \( E_1 \) or \( E_2 \) to a given integral (5.7, problem 13-20).

Other:
A. Given an equation in \( x \) and \( y \) and two points, find the arc length function \( s(x) \) or \( s(y) \) by evaluating an integral. Find the arc length \( AB \). Given \( \Delta x \) or \( \Delta y \), find \( \Delta s \) and \( \Delta s_0 \) (6.5).
B. Find local extrema of a function (4.3, 4.4).
C. Find (absolute) extrema on intervals \( (a,b) \), \([a,b)\), \((a,b]\), \([a,b]\) (4.1)
D. Apply Mean Value Theorem (4.2)