Calculus AB: Review Sheet

Chapters 25-34 (Chapter 1-25 on the first study guide)

Chapter 25: Properties of derivatives

$$\frac{d}{dx}[cf(x)] = c\frac{d}{dx}f(x)$$

$$\frac{d}{dx}(f(x)+g(x)) = \frac{d}{dx}(f(x))+\frac{d}{dx}(g(x))$$

$$\frac{d}{dx}(f(x)-g(x)) = \frac{d}{dx}(f(x))-\frac{d}{dx}(g(x))$$

Problems:

1) Find the derivative: (3(x^3+2))
2) Fine the derivative: 3x^2+4x+1
3) Find the derivative: 5x^2+3x

Chapter 26: More derivatives(KNOW ONLY SIN,COS,E^X, LN(X) for the test) and exponential growth and decay

- $$\boxed{\frac{d}{dx}(e^x) = e^x}$$

- $$\frac{d}{dx}\ln x = \frac{1}{x}$$

- $$\begin{bmatrix} \frac{d}{dx}\sin(x) = \cos(x) & \frac{d}{dx}\cos(x) = -\sin(x) \\\\ \frac{d}{dx}\tan(x) = \sec(x)^2 & \frac{d}{dx}\cot(x) = -\csc(x)^2 \\\\ \frac{d}{dx}\sec(x) = \sec(x)\tan(x) & \frac{d}{dx}\csc(x) = -\csc(x)\cot(x) \end{bmatrix}$$

- ONLY NEED TO KNOW SIN AND COS FOR TEST!!!!!!!
- Exponential growth and decay: A(t)=A0e^kt
    - A(t) : amount present at any particular time t
    - A0: is the initial amount present (the amount present at time t=0)
    - K: is a constant that must be determined for every problem (is closely related to the rate of growth)
- Problems:
    - Find the derivative: lnx-2sinx+cosx

Chapter 27: Equation of a tangent line and higher order derivatives

- Equation of a tangent line:
    - 1) Find the derivative of the function at x=a: f'(a) (slope)
    - 2) determine the point: (x,y) (a, f(a))
    - 3) Write answer in tangent form of a equation: y=f'(a)(x-a)+f(a)
- Solve:
    - Find the equation of the tangent to the graph of y=x^2-4x+3 when x=3
- Higher-order derivatives
    - f'(x)
    - f''(x)
    - f'''(x)

    Example:

$$f(x) = \sin x$$

$$f'(x) = \cos x$$

$$f''(x) = -\sin x$$

$$f'''(x) = -\cos x$$

$$f^{(4)}(x) = \sin x$$

$$f^{(5)}(x) = \cos x$$

Chapter 28: Graphs of Rational Functions/ A Special limit

- Rational Function: is a quotient of two polynomial functions
    - Zeros in the numerator and denominator, where all factors in denominator cancel are holes. Simplify by canceling factors then plug in x-value to find y-value
    - Zeros in the numerator (and not the denominator) are zeros of a function
    - Zeros in denominator (after canceling factors from the numerator) are the x-values where vertical asymptotes occur
    - Use a sign chart with zeros, VAs, and any hole on x-axis to determine when the rational function is positive or negative
- A special limit – go backwards from the definition of the derivative
    - $$lim_{h\to0}\frac{f(a+h)-f(a)}{h} = f'(a)$$
    - $lim_{\Delta x\to0} \ln(x + \Delta x) - \ln x/\Delta x$ = d/dx (ln x)
    - $lim_{h\to0} e^{x+h} - e^x /h$ = d/dx(e^x)

Chapter 29: Differentials

- Let y=f(x) be a function that can be differentiated. The differential of x (denoted by dx) is any nonzero real number. The differential of y(denoted by dy) is given by dy= f'(x)dx
- Practice: compute dy
  - 3/x^2+2sinx+2e^x

Chapter 31: Product Rule

$$(uv)' = uv' + u'v$$

$$u = 3x^2 - 5x, \quad v = 4x + 3$$

$$u' = 6x - 5, \quad v' = 4$$

Product Rule with differentials: $d(f(x)g(y)) = f'(x)dxg(y) + f(x)g'(y)dy$

- Practice:
  - Y=sinx3x^2
  - Y=2x^2cosx
  - S=x^2y^3

Chapter 32: Antiderivative/ Indefinite Integral

- Antidifferentiation: The inverse operation of differentiation is the operation of going back to the original function
- Indefinite Integral:
  - DON'T FORGET THE + C
- Practice:
  - Let f(x)=2x. Find a function F that is an antiderivative of f
  - Find the integral of cosx
  - Integral of e^x

Chapter 33: Factors of Polynomial Functions

- Called real polynomial if all its coefficients are real numbers
- Degree: is the value of its greatest exponent
- Even exponent on factor: then at that zero line bumps off
- Odd exponent on factor: at that zero line passes thru x-axis
- End Behavior: power even, end behavior is that of a parabola if the leading coefficient is negative then negative parabola
- Power odd:

- o Negative leading coefficient:
  - ↑↓
- o Positive leading coefficient:
  - ↓↑

Chapter 34: Implicit Differentiation

- Differentiate the x terms and multiply by dx
- Differentiate the y terms and multiply by dy
- Solve/complete the derivative
- Isolate dy/dx
- Problems:
  - o If y^3- is dy/dx xy-1=x^2+y^ 2, what