

### Chapter 3: L'Hopital's Rule & Exponential, Logarithmic & Inverse Trigonometric Functions

Terms to know:

- Exponential function, base
- Laws of exponents
- Natural exponential function
- One-to-one
- Inverse function (inverse property)
- Logarithmic function, base
- Natural logarithm function
- Properties of logarithms
- Logarithmic differentiation
- Indeterminate form (know all seven forms)
- L'Hopital's rule

Be able to:

- Sketch graphs of exponential and logarithmic functions.
- Find the domain and range of an exponential function or a logarithmic function.
- Find the domain and range of an inverse function  $f^{-1}(x)$ , based on domain and range of the function  $f(x)$ .
- Find an inverse function algebraically or graphically.
- Find the derivative of an inverse:  $(f^{-1})'(a)$ .
- Use laws of exponents to simplify an expression.
- Use properties of logarithms to simplify an expression or to expand an expression.
- Find limits of exponential and logarithmic functions.
- Evaluate the natural logarithm and exponential functions: **know** that  $\ln(1) = 0$ , for example.
- Find derivatives of logarithmic and exponential functions.
- Use logarithmic differentiation to find derivatives of complicated algebraic functions.
- Define the inverse trigonometric functions; know the domains and ranges of  $\arcsin(x)$ ,  $\arctan(x)$ ,  $\arccos(x)$ .
- Evaluate inverse trigonometric functions – from knowledge of the unit circle or by drawing a triangle.
- Simplify expressions involving inverse trig functions (using a triangle).
- **\*\*Prove  $\frac{d(\arctan(x))}{dx} = \frac{1}{1+x^2}$ .\*\***
- Find derivatives of  $\arcsin(x)$ ,  $\arctan(x)$  and  $\operatorname{arcsec}(x)$ .
- Evaluate indeterminate limits using l'Hopital's rule

### Chapter 3 Review Problems

Concept Check, p. 195: 1, 3, 4, 6 a – g, 8

True-False Quiz, p. 195: 1 – 14, 16

Exercises, pp. 196-197: 1 – 8, 11, 13, 14, 17, 19, 21 – 36, 38 – 42, 44 (use logarithmic differentiation), 56, 57 – 59, 61, 67 – 70, 72, 73, 75 – 82, 84

### Section 4.7: Antiderivatives

Terms to know:

- General antiderivative
- Indefinite integral
- Particular antiderivative
- Differential equation

Be able to:

- Construct general antiderivatives of functions, especially those listed in the table on p. 243.
- Find particular antiderivatives, given a function value.
- Set up and solve problems involving *rectilinear motion*: acceleration, velocity and position functions of moving objects.

### Chapter 4 Review Problems

Concept Check, p. 248: 9; True-False Quiz, p. 248: 16, Exercises, p. 250: 49 – 57

### Chapter 5: Integration

Terms to know:

- Sample point, approximating rectangle; right-hand endpoint
- Sigma notation (aka summation notation)
- Riemann sum
- Definite integral; limits of integration, integrand
- Definition of the definite integral as the limit of a Riemann sum
- Integrable
- Evaluation Theorem, Net Change Theorem
- Fundamental Theorem of Calculus
- Average value of a function
- Differential
- Change of variables; substitution rule

Be able to:

- Evaluate a definite integral by setting up a Riemann sum and taking its limit as  $n$  approaches infinity.
- Evaluate a definite integral by calculating a difference of areas or a net change.
- Estimate a definite integral by “counting boxes” to estimate the area under a graph.

- Demonstrate the connection between area under a graph and total change of a function.
- Use the properties of definite integrals.
- Use the evaluation theorem to evaluate a definite integral and to calculate the net change in a function.
- Interpret the result of a definite integral as a net change or difference of areas.
- Use the Fundamental Theorem of Calculus to find the derivative of a function defined as an integral (differentiation and integration are *inverse processes*).
- Find the average value of a function.
- Use the substitution rule to evaluate definite and indefinite integrals.

### **Chapter 5 Review Problems**

Concept Check, p. 300: 1, 4 – 10

True-False Quiz, pp. 300 – 301: 1 – 13

Exercises, pp. 301 – 303: 2, 3, 4, 5, 6, 7 – 29, 31, 32, 35 – 38, 42, 43, 45, 46, 47, 48, 50, 52, 53