Section 5.5 – 5.7 (Bases other than e and Applications / Inverse Trig. Functions / etc.)

Examining logarithmic / exponential expressions in other bases is pretty straightforward by applying a conversion factor… $a^x = e^{x\ln(a)}$ --- and --- $\log_a(x) = \frac{\ln(x)}{\ln(a)}$

Examples: Evaluate $\log_3(27)$, $\log_3(50)$

Derivatives for bases other than e are listed in theorem 5.13, but you can also convert to e before differentiating

Example: Evaluate the derivative of 3^{2x}

The rest of section 5.5 is a review of exponential expressions with some useful examples. Review with time.

Section 5.6 reviews inverse trigonometric functions ($\sin^{-1}(x)$ lies between what possible angles?) and the derivatives of the inverse functions are listed below

$\frac{d}{dx}$ [asin(u)] = $\frac{u'}{\sqrt{1-u^2}}$ $\frac{d}{dx}$ [atan(u)] = $\frac{u'}{1+u^2}$ $\frac{d}{dx}$ [asec(u)] = $\frac{u'}{|u|\sqrt{u^2-1}}$

$\frac{d}{dx}$ [acos(u)] = $\frac{-u'}{\sqrt{1-u^2}}$ $\frac{d}{dx}$ [acot(u)] = $\frac{-u'}{1+u^2}$ $\frac{d}{dx}$ [acsc(u)] = $\frac{-u'}{|u|\sqrt{u^2-1}}$

Examples: Evaluate $\frac{d}{dx}$ [asin(3x)] and $\frac{d}{dx}$ [acot(x^2)]

Following these examples, it can be seen that the integrals involving inverse trigonometric functions are

$\int \frac{du}{\sqrt{a^2-u^2}}$ = asin$\left(\frac{u}{a}\right)$ + C $\int \frac{du}{a^2+u^2}$ = $\left(\frac{1}{a}\right)$ atan$\left(\frac{u}{a}\right)$ + C $\int \frac{du}{u\sqrt{u^2-a^2}}$ = $\left(\frac{1}{a}\right)$ asec$\left(\frac{u}{a}\right)$ + C

--- See examples from the book for a better idea how expressions can be simplified prior to integration ---

Examples: Evaluate the indefinite integrals

$\int \frac{du}{\sqrt{9-x^2}}$ $\int \frac{12}{1+9x^2}\,dx$ $\int \frac{1}{x\sqrt{4x^2-1}}\,dx$

Section 5.8 discusses a special class of exponential functions called hyperbolic functions (think power lines between two poles). The derivatives and integrals follow the trend of common trig. functions (sinh x => cosh x)

Section 6.2 is a good application section to review (especially if taking differential equations in the future) for an introduction of exponential growth and decay (population growth, sales, radioactive decay)

Homework problems: (5.5) 1,2,3,5,9 (5.6) 39,43 (5.7) 1,2,3,4,5