

Fall 2007 Math 151

Week in Review
courtesy: Amy Austin
(covering sections 4.4 - 4.7)

Section 4.4

- Differentiate each function:
 - $f(t) = \cos^2 t(\ln t)$
 - $f(x) = \ln(\sin 2x)$
 - $h(x) = \ln(\ln 3x)$
 - $y = \ln \sqrt{\frac{x^2 + 1}{3x - 5}}$
 - $f(x) = \log_5(e^{10x})$
 - $f(x) = 3^{\tan(7x)}$
 - $y = x^{\sin x}$
- Find the equation of the tangent line to the graph of $f(x) = x \ln x$ at $x = e^2$.
- What is the slope of the parametric curve $x = t \ln t$, $y = 2^{3t}$ at the point $(0, 8)$?

Section 4.5

- A bacteria culture starts with 400 bacteria and the population triples every 20 minutes.
 - Find an expression for the number of bacteria after t hours.
 - Find the number of bacteria after 2 days.
 - When will the population reach 20,000?
- A curve that passes through the point $(0, 25)$ has the property that the slope at every point (x, y) is eight times the y coordinate. Find the equation of the curve.
- A tank contains 200 liters of brine with a concentration of 0.1 kg of salt per liter. Pure water enters the tank at a rate of 5 liters per minute. The solution is kept mixed and exits the tank at the same rate. How many kg of salt will remain after half an hour?
- A pie is taken from an oven, where the temperature is 450° , to a 75° room. After 15 minutes, the temperature of the pie reads 350° . What will the temperature of the pie be after 27 minutes?

Section 4.6

- Compute the following without the aid of a calculator.
 - $\arcsin \frac{\sqrt{3}}{2}$
 - $\arccos(-\frac{1}{\sqrt{2}})$
 - $\sin^{-1}(-\frac{\sqrt{2}}{2})$
 - $\arctan \frac{1}{\sqrt{3}}$
 - $\cot \arccos(-\frac{3}{5})$
 - $\sin(\arcsin 2)$
 - $\arccos(\cos(\frac{2\pi}{3}))$
 - $\arctan(\tan \frac{5\pi}{4})$
 - $\cos(\arccos 0.4)$
 - $\arcsin(\sin(\frac{11\pi}{6}))$
 - $\arccos(\cos \frac{5\pi}{4})$
 - $\sin(2 \arccos(\frac{1}{3}))$
- Find the derivative of $y = \arctan(1 - x)$
- Find the equation of the tangent line to the graph of $y = \arcsin \frac{x}{2}$ at $x = -1$.
- What is the domain of $f(x) = \arcsin(2x - 1)$? Of $\arctan(2x - 1)$?
- Find $\lim_{x \rightarrow \infty} \arctan x$.
- $\cos(\arctan x)$ is equivalent to what?

Section 4.8

- Find the following limits.
 - $\lim_{x \rightarrow \infty} \frac{(\ln x)^2}{x - 1}$
 - $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$
 - $\lim_{x \rightarrow 0^+} x^2 \ln x$
 - $\lim_{x \rightarrow \infty} (e^x + x)^{\frac{1}{x}}$
 - $\lim_{x \rightarrow 0} (1 + \sin 4x)^{\cot x}$
 - $\lim_{x \rightarrow 0} (\sin x)^{\tan x}$
 - $\lim_{x \rightarrow 1} \left(\frac{1}{\ln x} - \frac{1}{x - 1} \right)$