Fall 2005 Math 151

Week in Review

courtesy: Amy Austin

(covering sections 4.4 - 4.6)

Section 4.4

1. Differentiate each function:

   a.) $f(t) = \cos(\ln t)$

   b.) $h(x) = \ln(\ln x)$

   c.) $f(x) = x^3 \ln(2x+1)$

   d.) $y = \ln \sqrt{\dfrac{x^2+1}{3x-5}}$

   e.) $f(x) = \log_2(3 - x^3)$

   f.) $f(x) = 3^{\tan 2x}$

   g.) $y = x^{\sin x}$

2. Find the equation of the tangent line to the graph of $f(x) = x \ln x$ at $x = e^2$.

3. What is the slope of the parametric curve

   $x = \ln(t^3 + 4t + 1)$, $y = 2^t$ at $t = 0$?

Section 4.5

4. A bacteria culture starts with 4000 bacteria and the population triples every half-hour.

   a.) Find an expression for the number of bacteria after t hours.

   b.) Find the number of bacteria after 20 minutes.

   c.) When will the population reach 20,000?

5. Amyium-210 has a half-life of 140 days. If a sample has a mass of 200 mg, find the mass after 100 days.

6. A curve that passes through the point $(0, 5)$ has the property that the slope at every point (x, y) is twice the y coordinate. Find the equation of the curve.

7. A thermometer is taken from a room where the temperature is 20°C to the outdoors, where the temperature is 5° C. After one minute, the temperature reads 12°C. What will the temperature of the object be after 2 minutes?

8. A tank contains 1500 liters of brine with a concentration of 0.3 kg of salt per liter. Pure water enters the tank at a rate of 20 liters per minute. The solution is kept mixed and exits the tank at the same rate.

   a.) How many kg of salt will remain after half an hour?

   b.) When will the concentration be reduced to 0.2 kg of salt per liter?

Section 4.6

9. Compute the following without the aid of a calculator.

   a.) $\arcsin \dfrac{1}{2}$ b.) $\arccos \dfrac{1}{\sqrt{2}}$

   c.) $\sin^{-1}(-\dfrac{\sqrt{3}}{2})$ d.) $\arctan \sqrt{3}$

   e.) $\sin \arccos(-\dfrac{4}{5})$ f.) $\cos(\arctan x)$

   g.) $\arccos(\cos(\dfrac{2\pi}{3}))$ h.) $\arctan(\tan \dfrac{3\pi}{4})$

   i.) $\cos(\arccos 0.4)$ j.) $\arcsin(\sin((\dfrac{11\pi}{6}))$

   k.) $\arccos(\cos \dfrac{5\pi}{4})$ l.) $\sin(2 \arccos(\dfrac{1}{3}))$

10. Find the derivative of $y = \arctan \sqrt{x}$

11. Find the equation of the tangent line to the graph of $y = \arcsin \dfrac{x}{2}$ at $x = 1$.

12. What is the domain of $f(x) = \arcsin(2x - 1)$? Of $\arctan(2x - 1)$?

13. Find $\lim\limits_{x \to \infty} \arctan x$.