MA 121 Summer I 2007
Test 3
Copy B

Name**Key**

Show your work on the test page or scrap paper. Each problem is worth ten points. Simplify you answers as much as possible.

1. In 1995 Apex had a population of 6000 and in 2005 Apex had a population of 9000. Assuming the uninhibited growth model, find a function representing the population of Apex t years after 1995. Estimate the population of Apex in 2010.
   $P(t) = 6000e^{.040t}$, **P(15)=11022**

2. (a) Find the present value of a \$5000 savings bond due in 8 years that gets 4% interest compounded continuously. \$3630.75

   (b) If a radioactive element has a half-life of 2000 years, how many years does it take for the element to lose 30% of its original amount? **1029 years**

3. Find $f'(x)$ for

   (a) $f(x) = 3^{2x+1}$
   $f'(x) = (\ln 3)3^{2x+1}(2)$

   (b) $f(x) = x\log_2(x)$
   $f'(x) = \log_2(x) + \frac{1}{\ln 2}$

4. Let $f'(x) = 4x^3 - 4$.

   (a) Find $f(x)$.
   $f(x) = x^4 - 4x + C$

   (b) Find $f(x)$ such that $f(1) = 4$.
   $f(x) = x^4 - 4x + 7$

5. Let $f(x) = 2 + \frac{1}{x}$.

   (a) Find $\int f(x)\mathrm{d}x = 2x + \ln(x) + C$

   (b) Compute $\int_1^3 f(x)\mathrm{d}x = 4 + \ln(3)$

   (c) Find the average value of the function $f(x)$ over the interval $[1, 3]$. $\frac{4+\ln(3)}{2}$

6. Compute the following integrals.

   (a) $\int (2x-3)(x^2-3x-4)^3 \mathrm{d}x = \frac{(x^2-3x-4)^4}{4} + C$

   (b) $\int_4^5 (2x-3)(x^2-3x-4)^3 \mathrm{d}x = \frac{6^4}{4} = 324$

7. Compute the following integrals.

   (a) $\int 5e^x \mathrm{d}x = 5e^x + C$

   (b) $\int_{-\infty}^0 5e^x \mathrm{d}x = 5$

8. Find the area of the region bounded by $y = 12x + 2$ and $y = 3x^2 + 2$ 32

9. Suppose a company sells widgets with a supply function given by $S(x) = x + 5$ and a demand function of $D(x) = -3x + 21$.

   (a) Find the equilibrium point.$(4, 9)$

   (b) Find the Consumer's surplus.24

10. Find the volume of the shape generated by rotating $y = \sqrt{3}x$ from $x = 0$ to $x = 4$ around the $x-$axis.64π