MA 121 Summer I 2007
Test 3
Copy A

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 8000 and in 2000 Apex had a population of 9600. Assuming the uninhibited growth model, find a function representing the population of Apex t years after 1995. Estimate the population of Apex in 2010.
   $P(t) = 8000e^{.036t}$, **P(15)=13728**

2. (a) Find the present value of a \$4000 savings bond due in 5 years that gets 5% interest compounded continuously. \$3115.20

   (b) If a radioactive element has a half-life of 3000 years, how many years does it take for the element to lose 60% of its original amount? **3965 years**

3. Find $f'(x)$ for

   (a) $f(x) = x^2 5^x$
   $f'(x) = 2x5^x + x^2 5^x (\ln 5)$

   (b) $f(x) = \log_3(2x-7)$
   $f'(x) = \frac{2}{(\ln 3)(2x-7)}$

4. Let $f'(x) = 3x^2 - 4x + 5$.

   (a) Find $f(x)$.
   $f(x) = x^3 - 2x^2 + 5x + C$

   (b) Find $f(x)$ if $f(1) = 4$.
   $f(x) = x^3 - 2x^2 + 5x$

5. Let $f(x) = 2x + 3 - \frac{18}{x^3}$.

   (a) Find $\int f(x)\mathrm{d}x = x^2 + 3x + \frac{9}{x^2} + C$

   (b) Compute $\int_1^3 f(x)\mathrm{d}x = 6$

   (c) Find the average value of the function $f(x)$ over the interval $[1, 3]$.**3**

6. Compute the following integrals.

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

   (b) $\int_2^4 \frac{2x-3}{x^2-3x+3} \mathrm{d}x = \ln(7)$

7. Compute the following integrals.

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

   (b) $\int_0^\infty 4e^{-2x} \mathrm{d}x = 2$

8. Find the area of the region bounded by $y=-3x+1$ and $y=-x^2+1$ $\frac{9}{2}$

9. Suppose a company sells widgets with a supply function given by $S(x)=2x+3$ and a demand function of $D(x)=-4x+21$.

   (a) Find the equilibrium point.$(3,9)$

   (b) Find the Consumer's surplus.18

10. Find the volume of the shape generated by rotating $y=\sqrt{x+2}$ from $x=0$ to $x=4$ around the $x-$axis.16π