

AP Problems Chapter 8 and 9

1. Cat #4 Partial Fractions  
Ch 8&9

$$\int \frac{x^2 - x + 4}{x(x-1)(x-2)} dx$$

2. Cat #4 Inverse Trig Functions  
Ch 8&9

$$\int \frac{e^x}{\sqrt{16 - e^{2x}}} dx$$

3. Cat #16 Growth and Decay Ch. 8&9

If human population triples in 100 years, in how many years will the population become 5 times what it was initially?

4. Cat #13 Differential Equations Ch 8&9

Given the differential equation  $\frac{dy}{dx} = 2y - 5 \sin x$

- A) Find the general solution  
B) Find the particular solution whose tangent line at  $x=0$  has a slope of 7

5. Cat #10 Ch 8&9

Given two function  $f$  &  $g$  defined by  $f(x) = \tan x$  and  $g(x) = \sqrt{2} \cos x$

- A) Find the coordinates of the point of intersection of  $f$  &  $g$ ,  $0 < x < \pi/2$   
B) Sketch  
C) Find area enclosed by the  $y$ -axis and the graphs of  $f$  &  $g$

6. Cat #11 Volume and integration by parts Ch 8&9  
Find the volume of the solid if region R is revolved about the y-axis. Region R is  
Enclosed by x-axis, y-axis,  $x=2$ ,  $y = 2e^x + 3x$

7. Cat #4 Ch 8&9

A) Determine  $\int x^2 e^{2x} dx$

B) Using integration by parts, derive a general formula for  
 $\int x^n e^{kx} dx$ ,  $k \neq 0$  in which the resulting integrand involves  $x^{n-1}$

8. Cat #4 Ch 8&9

$$\int \frac{x^2}{\sqrt{9-x^2}} dx$$

9. Cat #4 Ch 8 & 9  $\int x \cos x dx$

10. Cat #4 Ch 8&9

$$\int \frac{dx}{x\sqrt{4x^2+9}}$$

11. Cat #3 Ch 8&9

$$\frac{d}{dx} [(1 + \cos^{-1} 3x)^3]$$

12. Cat #4 Ch 8&9

$$\int \frac{1}{x^2 + 16} dx$$

13. Cat #4 Trig substitution Ch 8&9

$$\int \frac{dx}{1 - x^2}$$

14. Cat #4 Ch 8&9

$$\int \sin^2 x \cos^3 x dx$$

15. Cat #10 Ch 8 & 9 The region R is enclosed by the graphs of  $y = \tan^2 x$ ,  $y = \frac{1}{2} \sec^2 x$ , and y-axis in the 1<sup>st</sup> quadrant

- A) Sketch
- B) Find the area of region R
- C) Set up, but do not integrate, an integral expression in terms of a single variable for the volume of the solid formed by revolving region R about the x-axis

16. Cat # 16 Ch 8 & 9

$$M(t) = 4 e^{\ln 3 t/9}$$

A) Use trapezoidal Rule to estimate with three equal subdivisions

B)  $\int_4^7 M(t) dt$  Use Simpson's Rule to estimate with 6 equal subdivisions

$$\int_4^7 M(t) dt$$