AP Calculus AB – Practice Chapter 5

If the following are separable, solve the differential equation. If not separable, say so ☺

    1. $y'=2xy$ (1,2)   2. $y'= e^y \sin x$ (0, 0)   3. $y'= \ln(xy)$ (1, 1)   4. $y' = y\cos x + y$ (0, 2)

    5. $y' = \dfrac{e^{x-y^2}}{y}$, (0,0)   6. $xy' = \ln(x^y)$ (1, 1)   7. $y' = 2x - 3y$ (1, 2)

8. Show if $y = C_1 x + C_2 x^3$ satisfies the differential equation $x^2 y'' - 3xy' + 3y = 0$. Then find the particular solution that satisfies the initial condition $y = 0$ and $y'=4$ when $x=2$.

9. The rate of growth of the US population is proportional to the population at any time t. If the population was 4 million in 1790 and 180 million in 1960, give the equation for the population at time t and find the population predicted for 2020.

10. A bacterial population grows at a rate proportional to its size. Initially there are 10000 and after 10 days there are 24000 bacteria. Set up a differential equation and solve to find the population at time t. How long will it take the initial population to double?

11. In processing raw sugar, the rate of change of the amount of raw sugar is proportional to the amount of raw sugar remaining. Set up a differential equation, and solve for the amount of sugar at any time t if 500 kg of raw sugar reduces to 300 kg of sugar during the first 24 minutes. What is the half life?

12. The slope of a curve at (x, y) is given by $x^2 y$. Find the equation of the curve if it contains the point (1, 3).

13. A 2000 gallon tank can support no more than 150 guppies. Six guppies are introduced into the tank. Assume that the rate of growth of the population is $\dfrac{dP}{dt} = 0.0015P(300 - 2P)$ where time t is in weeks.
    a) What population of guppies will result in the fastest growing population?
    b) Determine $\lim\limits_{t \to \infty} P(t)$

Find the derivatives of the following:

14. $y = 4^{\tan x^2} - \log_2(x^3 - \sec x)$ 15. $y = e^{6\ln x + 2\ln 4 - \ln 2}$ 16. $y = (\tan x)^{\sec x}$ 17. $y = \log\left|\dfrac{3x^3}{(x-1)(x+4)}\right|$

Review integrals from practice sheet

p. 407 # 65-72, 77, 81-84, 93-98, 105, 106