AP Calculus – Differential Equations Handout

Show work on notebook paper on all problems

1.) Find $\frac{dy}{dx}$ for the following curves.

a.) $x^2+5y^3=12-3xy$

b.) $y=\tan^{-1}(x)$

c.) $y=\cos(x-y)$

2.) Consider the curve given by $x^2-xy+y^2=12$

a.) Find $\frac{dy}{dx}$

b.) Find the coordinates of any points where $\frac{dy}{dx}=0$

c.) Find the numerical value of $\frac{d^2y}{dx^2}$ at the points found in part b.

3.) If $\frac{dy}{dt}=ky$ and *k* is a nonzero constant, then *y* could be (1998-21)

a.) $2e^{kty}$	b.) $2e^{kt}$	c.) $\frac{1}{2}ky^2+\frac{1}{2}$
d.) $kty+5$	e.) $e^{kt}+3$	

4.) The rate of change of the volume, V, of water in a tank with respect to time, t, is directly proportional to the square root of the volume. Which of the following is a differential equation that describes this relationship? (2003-12)

(A) $V(t)=k\sqrt{t}$	(B) $V(t)=k\sqrt{V}$	(C) $\frac{dV}{dt}=k\sqrt{t}$
(D) $\frac{dV}{dt}=\frac{k}{\sqrt{V}}$	E) $\frac{dV}{dt}=k\sqrt{V}$	

5.) A particle moves along the *x*-axis so that its acceleration at any time $t>0$ is given by $a(t)=\ln(1+2^t)$. If the velocity of the particle is 3 at time $t=1$, then the velocity of the particle at time $t=2$ is

a.) 1.462	b.) 2.609	c.) 3.555	d.) 3.886	e.) 4.346

6.) Population *y* grows according to the equation $\frac{dy}{dt}=ky$, where *k* is a constant and *t* is measured in years. If the population doubles every 10 years, then the value of *k* is

a.) 0.069	b.) 0.200	c.) 0.301	d.) 3.322	e.) 5.000

7.) A puppy weighs 2.0 pounds at birth and 3.5 pounds two months later. If the weight of the puppy during its first 6 months is increasing at a rate proportional to its weight, then how much will the puppy weigh when it is 3 months old? (1988-9)

a.) 6.5 pounds	b.) 4.6 pounds	c.) 4.2 pounds
d.) 5.6 pounds	e.) 4.8 pounds	

8.) Solve $y'=\frac{5x}{y}$ for y.

9.) Find y(1) if $y'=-x^2+2x$ and $y(2)=1$.

10.) Solve $\frac{dy}{dx}=\frac{x}{y}$ for y.