Name_______________________________________ Date___________________________ Deciduous Tree______

AP Calculus: 5.1 – 6.4   Calculator permitted

Part I: Multiple Choice—show all work for credit. No work, no credit. Put the capital letter in the blank to the left of each question number.

_____ 1. A solid is generated when the region in the first quadrant enclosed by the graph of $y=\left(x^2+1\right)^3$, the line $x=1$, the *x*-axis, and the *y*-axis is revolved about the *x*-axis. Its volume is found by evaluating which of the following integrals?

(A) $\pi\int_1^8\left(x^2+1\right)^3 dx$ (B) $\pi\int_1^8\left(x^2+1\right)^6 dx$ (C) $\pi\int_0^1\left(x^2+1\right)^3 dx$ (D) $\pi\int_0^1\left(x^2+1\right)^6 dx$ (E) $2\pi\int_0^1\left(x^2+1\right)^6 dx$

_____ 2. If $\dfrac{dy}{dx}=\dfrac{3x^2+2}{y}$, and $y=4$ when $x=2$, then when $x=3$, $y=$

(A) $\sqrt{66}$ (B) $-\sqrt{66}$ (C) 58   (D) $-\sqrt{58}$ (E) $\sqrt{58}$

_____ 3. The volume generated by revolving about the *y*-axis the region enclosed by the graphs of $y=9-x^2$ and $y=9-3x$, for $0\le x\le 2$, is

(A) 2π (B) 4π (C) 8π (D) 24π (E) 48π

_____ 4. $\int \ln(2x)\,dx =$

(A) $\dfrac{\ln(2x)}{x}+C$ (B) $\dfrac{\ln(2x)}{2x}+C$ (C) $x\ln x - x + C$ (D) $x\ln 2x - x + C$ (E) $2x\ln 2x - 2x + C$

_____ 5. Find the distance traveled for $t \in [0,4]$ seconds for a particle whose velocity, in ft/sec, is given by $v(t) = 7e^{-t^2}$.

(A) 0.976 (B) 6.204 (C) 6.359 (D) 12.720 (E) 7.000

_____ 6. Find the area of the region bounded by the graphs of the $f(x) = e^{-x^2/4}$ and $y = 0.5$.

(A) 0.516 (B) 0.480 (C) 0.240 (D) 1.032 (E) 1.349

_____ 7. The base of a solid S is the region enclosed by the graphs of $4x + 5y = 20$, the x-axis, and the y-axis. If the cross-sections of S perpendicular to the x-axis are semicircles, then the volume of S is

(A) $\dfrac{5\pi}{3}$ (B) $\dfrac{10\pi}{3}$ (C) $\dfrac{50\pi}{3}$ (D) $\dfrac{225\pi}{3}$ (E) $\dfrac{425\pi}{3}$

_____ 8. $\int \frac{18x-17}{(2x-3)(x+1)}\,dx =$

(A) $8\ln|2x-3|+7\ln|x+1|+C$ (B) $2\ln|2x-3|+7\ln|x+1|+C$ (C) $4\ln|2x-3|+7\ln|x+1|+C$

(D) $7\ln|2x-3|+2\ln|x+1|+C$ (E) $\frac{7}{2}\ln|2x-3|+4\ln|x+1|+C$

_____ 9. Use Euler's Method with $\Delta x = 0.2$ to approximate $y(1)$ if $\frac{dy}{dx} = y$ and $y(0)=1$.

(A) 1.200 (B) 2.075 (C) 2.488 (D) 5.513 (E) 3.872

_____ 10. Which of the following gives the best approximation of the length of the arc of $y=\cos(2x)$ from $x=0$ to $x=\frac{\pi}{4}$?

(A) 0.785 (B) 0.955 (C) 1.0 (D) 1.318 (E) 1.977

Part I: Free Response—show all work in the space provided for credit. Notation, notation, notation. Clearly communicate your results. Include units on all final numeric and verbal answers.

10.

t (minutes)	0	1	2	3	4	5	6
$C(t)$ (ounces)	0	5.3	8.8	11.2	12.8	13.8	14.5

Hot water is dripping through a coffeemaker, filling a large cup with coffee. The amount of coffee in the cup at time t, $0 \le t \le 6$, is given by a differentiable function C, where t is measured in minutes. Selected values of $C(t)$, measured in ounces, are given in the table above.

(a) Use the data in the table to approximate $C'(3.5)$. Show the computations that lead to your answer, and indicate units of measure.

(b) Is there a time t, $2 \le t \le 4$, at which $C'(t) = 2$? Justify your answer.

(c) Use a midpoint sum with three subintervals of equal length indicated by the data in the table to approximate the value of $\frac{1}{6}\int_0^6 C(t)\,dt$. Using correct units, explain the meaning of $\frac{1}{6}\int_0^6 C(t)\,dt$ in the context of the problem.

(d) The amount of coffee in the cup, in ounces, is modeled by $B(t) = 16 - 16e^{-0.4t}$. Using this model, find the rate at which the amount of coffee in the cup is changing when $t = 5$.