Name________________________________________________ Date______________ Per_____

TEST: AP Calculus: Test—4.1-4.4 NO CALCUALTOR

PART I: Multiple Choice. Put the Capital Letter of the correct answer choice in the space to the left of each problem number.

_____ 1. Let $F(x)=\int_1^x \frac{(\ln x)^3}{x}dx$, what is the value of $F(e)$?

(A) 0 (B) $\frac{1}{2}$ (C) $\frac{1}{4}$ (D) $e$ (E) 1

_____ 2. The function $f$ is continuous on the closed interval $[2,8]$ and has values that are given in the table below. Using the subintervals indicated by the data, what is the **trapezoidal** approximation of $\int_2^8 f(x)\,dx$?

| $x$ | 2 | 5 | 7 | 8 |
|---|---|---|---|---|
| $f(x)$ | 10 | 30 | 40 | 20 |

(A) 210 (B) 190 (C) 160 (D) 130 (E) 110

_____ 3. If $f$ is continuous on the interval $[a,b]$, then there exists $c$ such that $a\le c\le b$ and $\int_a^b f(x)\,dx=$

(A) $f(c)(b-a)$ (B) $f'(c)(b-a)$ (C) $f(b)-f(a)$ (D) $\frac{f(b)-f(a)}{b-a}$ (E) $\frac{f(c)}{b-a}$

_____ 4. $\int x^2\cos\left(x^3\right)dx=$

(A) $\sin\left(\frac{x^4}{4}\right)+C$ (B) $-\frac{1}{3}\sin\left(x^3\right)+C$ (C) $\frac{1}{3}\sin\left(x^3\right)+C$

(D) $-\frac{x^3}{3}\sin\left(x^3\right)+C$ (E) $\frac{x^3}{3}\sin\left(x^3\right)+C$

_____ 5. Using the substitution $u = 2x+1$, $\int_0^2 \sqrt{2x+1}\,dx$ is equivalent to

(A) $\frac{1}{2}\int_0^2 \sqrt{u}\,du$ (B) $\frac{1}{2}\int_1^5 \sqrt{u}\,du$ (C) $\int_0^2 \sqrt{u}\,du$ (D) $\int_1^5 \sqrt{u}\,du$ (E) $\frac{1}{2}\int_{-1/2}^{1/2} \sqrt{u}\,du$

_____ 6. $\frac{d}{dx}\left(\int_0^{x^2} \sin\left(t^3\right)dt\right) =$

(A) $-\cos\left(x^6\right)$ (B) $2x\sin\left(x^6\right)$ (C) $\sin\left(x^3\right)$ (D) $2x\sin\left(x^3\right)$ (E) $\sin\left(x^6\right)$

_____ 7. The velocity, in ft/sec, of a particle moving along the $x$-axis is given by the function $v(t) = t^2 + 1$. What is the **average velocity** of the particle from time $t = 0$ to $t = 3$?

(A) 12 ft/sec (B) 3 ft/sec (C) 4 ft/sec (D) $\sqrt{3}$ ft/sec (E) $\frac{10}{3}$ ft/sec

_____ 8. An antiderivative for $\frac{1}{x^2 - 2x + 2}$ is

(A) $-\left(x^2 - 2x + 2\right)^{-2}$ (B) $\ln\left|x^2 - 2x + 2\right|$ (C) $\operatorname{arcsec}(x-1)$ (D) $\arctan(x-1)$ (E) $\ln\left|\frac{x-2}{x+1}\right|$

_____ 9. $\int \frac{x}{x^2 - 4}\,dx =$

(A) $\frac{1}{2}\ln\left|x^2 - 4\right| + C$ (B) $\frac{1}{2}\arctan\left(\frac{x}{2}\right) + C$ (C) $2\ln\left|x^2 - 4\right| + C$

(D) $\frac{-1}{4\left(x^2 - 4\right)^2} + C$ (E) $\frac{1}{2\left(x^2 - 4\right)} + C$

PART II: Free Response

10. Evaluate 6 of the 8 of the following. Don't forget your +C!!

(a) $\int \frac{\sec^2 x}{\sqrt{\tan x}}\,dx$

(b) $\int \frac{e^x}{3+e^x}\,dx$

(c) $\int \frac{x+1}{\left(x^2+2x+2\right)^3}\,dx$

(d) $\int \frac{x}{\sqrt{x+1}}\,dx$

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

(f) $\int \frac{4}{5x\sqrt{x^2-3}}dx$

(g) $\int \frac{t^3}{\sqrt{1-t^8}}\,dt$

(h) $\int \left( \frac{4x+3\sqrt[3]{x}-x^2}{2x} \right) dx$