Test Chapter 4 A.P. Calculus Name _____

I. Multiple Choice

_____ 1. $\lim_{x\to 0}\dfrac{\sin 5x}{\sin 3x} =$

A) 0 B) 1 C) $\dfrac{5}{3}$ D) $\dfrac{3}{5}$ E) $+\infty$ F) $-\infty$

_____ 2. If $y = x^2e^x$, Then $\dfrac{dy}{dx} =$

A) $2xe^x$ B) $x\left(x+2e^x\right)$ C) $xe^x\left(x+2\right)$ D) $2x+e^x$

E) $2x + e$

_____ 3. If $y = \dfrac{\ln x}{x}$, then $\dfrac{dy}{dx} =$

A) $\dfrac{1}{x}$ B) $\dfrac{1}{x^2}$ C) $\dfrac{\ln x - 1}{x^2}$ D) $\dfrac{1-\ln x}{x^2}$ E) $\dfrac{1+\ln x}{x^2}$

_____ 4. $\dfrac{d}{dx}\left(\ln e^{2x}\right) =$

A) $\dfrac{1}{e^{2x}}$ B) $\dfrac{2}{e^{2x}}$ C) $2x$ D) 1 E) 2

_____ 5. If $\ln x - \ln\left(\dfrac{1}{x}\right) = 2$, then $x =$

A) $\dfrac{1}{e^2}$ B) $\dfrac{1}{e}$ C) e D) $2e$ E) e^2

_____ 6. If y = Arctan (2x) , Then $\frac{dy}{dx}$ =

A) $\text{Arcsec}^2(2x)$ B) $2\,\text{Arcsec}^2(2x)$ C) $\frac{1}{1+4x^2}$

D) $\frac{2}{1+4x^2}$ E) None of these

_____ 7. Let $f(x) = \cos(\text{Arctan}\, x)$. What is the **range** of f?

A) $-\frac{\pi}{2} < y < \frac{\pi}{2}$ B) $0 < y \le 1$ C) $0 \le y \le 1$

D) $-1 < y < 1$ E) $-1 \le y \le 1$

_____ 8. $\log_9 3$ =

A) $-\frac{1}{3}$ B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) -2 E) 2

_____ 9. A 20 foot ladder slides down a wall at 5 ft/sec. At what speed is the bottom sliding out when the top of the ladder is 10 feet from the floor?

A) 0.346 ft/sec B) 2.887 ft/sec C) 0.224 ft/sec

D) 5.774 ft/sec E) 4.472 ft/sec

II. Free Response Show all work.

10. Determine $\frac{dy}{dx}$ if $x^3y^4 - \sin(2x) = y$

11. Determine $\frac{d}{dx}\left(\text{Tan}^{-1}\left(3e^{2x}\right)\right)$

12. Give the ***exact value*** of $\sin\left(\sin^{-1}\left(\frac{1}{5}\right) + \cos^{-1}\left(\frac{5}{13}\right)\right)$

13. $\lim_{x \to -2}\left(\frac{x^3+8}{x+2}\right)$ =

14. Sketch the graph of $y = \text{Sin}^{-1}x$

15. Derive the formula for the derivative of $y = Cos^{-1}x$

16. Water flows at 8 cubic feet per minute into a cylinder with radius 4 feet. How fast is the water level rising?

17. Determine the derivative of $y = 2^{x}$.

18. Determine the derivative of $y = x^{2e}$.

19. Determine the number of years it takes to accumulate $1,000 if you start with $600 invested at 5.25% compounded quarterly.

    Use the compound interest formula: $A = P\left(1+\frac{r}{m}\right)^{mt}$

20. $\lim_{x\to 1}\left(\frac{x^2-1}{x^3-1}\right) =$

Extra Credit: Determine the effective Annual Yield of 6% compounded quarterly.