Test A.P. Calculus Sections 3.1 – 3.5 Name ____

I. Multiple Choice

_____ 1. Determine $f'(x)$ if $f(x) = \tan(x)\cos(x)$

(A) $\cos x$ (B) $-\sin x$ (C) $\sin x$ (D) $-\cos x$ (E) 0

_____ 2. Given $y = f(x) = 2x^3$, determine the average rate of change of y with respect to x over the interval [1, 3].

(A) 52 (B) -52 (C) -26 (D) 26 (E) 0

_____ 3. An object moves in a straight line so that after t seconds its distance in mm from its original position is given by $s = t^2 + t$. Its instantaneous velocity at t = 3 seconds is

(A) 18 mm (B) 19 mm (C) 12 mm (D) 7 mm (E) 0 mm

_____ 4. If $y = x^6$, $\dfrac{dy}{dx} =$

(A) $6x^6$ (B) $5x^5$ (C) $6x^5$ (D) $5x^6$ (E) x^5

_____ 5. If $u = 3x^2 - 93$, then $\dfrac{du}{dx} =$

(A) 0 (B) $6u$ (C) $6x - 93$ (D) 6 (E) $6x$

_____ 6. If $f(x) = 18 - \pi$, then $f'(x) =$

(A) 18π (B) 0 (C) π (D) -1 (E) $-\pi$

_____ 7. Given $y = \sqrt{x}$ Determine $\dfrac{dy}{dx}$

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

_____ 8. The volume of a sphere is given by the formula $V = \dfrac{4}{3}\pi r^3$.

Assuming that the radius is changing, the formula for the instantaneous rate of change of V with respect to r is:

(A) $\dfrac{4}{3}\pi r^2$ (B) $4\pi r^2$ (C) $12\pi r^2$ (D) $4\pi r^2 + \dfrac{4}{3}r^3$ (E) $2\pi r^3$

______ 9. If $y = \dfrac{2x}{x-2}$, $\left.\dfrac{dy}{dx}\right|_{x=1} =$

(A) -4 (B) -3 (C) 4 (D) 3 (E) 0

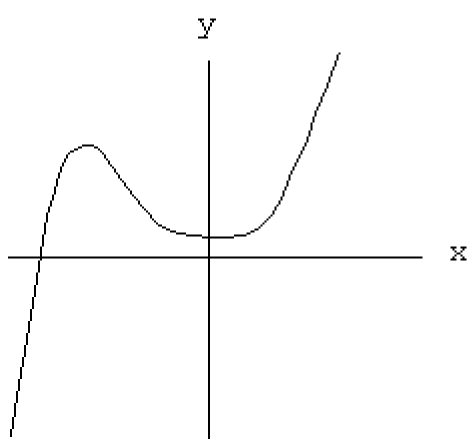
______ 10. Determine the value of k so that the line $y = 2x$ is tangent to the curve $y = x^2 + k$.

(A) 2 (B) 0 (C) -1 (D) 1 (E) None of these answers

II. Free Response

Do ALL work on your own paper.

11. Sketch the graph of the derivative of the function whose graph is shown below:



12. Given $g(x) = \sqrt{x}\, f(x)$. Determine $g'(1)$ given that $f(1) = 3$ and $f'(1) = 4$.

13. Determine $\dfrac{d^2y}{dx^2}$ if $y = x \sin x$.

14. If $y = \cos(x)$, Determine $\dfrac{d^{102}y}{dx^{102}}$.

15. Determine the equation of the line tangent to the graph of $y = f(x)$ at the point where **x** = -3 if $f(-3) = 4$ and $f'(-3) = -2$.

16 - 17. Given the function $g(x) = \frac{x-1}{2x+4}$.

16. Determine $\frac{d}{dx}\left(g(x)\right)$

17. Write the equation of the line tangent to $g(x)$ at the point where x = -1.

18. Given $y = x^5$, Determine $y'''(1)$.

19. Write out a complete definition of the derivative.

20. Given $y = x^2 - 2x$, use the definition of the derivative to determine $\frac{dy}{dx}$.

21. Extra Credit:

A small water balloon was projected vertically upward by a disgruntled calculus student with an initial velocity of 160 ft/sec. It reaches an elevation of $s = 160t - 16t^2$ feet at the end of *t* seconds. How fast is it traveling at t = 3 seconds? When would it hit the calculus teacher who just happens to be walking by a few seconds later and who is 6 feet tall?