Name_____ Date_____ Famous General_____

AP Calculus TEST: 2.1-2.4 , NO CALCULATOR

Part Ein: Multiple Choice—Put the correct CAPITAL letter in the space to the left of each question.

_____ 1. In the *xy*-plane, the line $x+y=k$, where *k* is a constant, is tangent to the graph fo $f(x)=x^2+3x+1$. What is the value of *k* ?

(A) -3 (B) -2 (C) -1 (D) 0 (E) 1

$$g(x)=\begin{cases} ax^2+bx+2, & \text{for } x\le 1 \\ \dfrac{2b}{x}-a & \text{for } x>1 \end{cases}$$

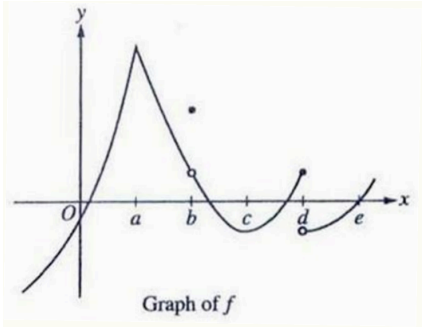
_____ 2. Let *g* be the function defined above, where a and b are constants. If g is differentible at $x=1$, what is the value of a ?

(A) $-\frac{3}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) $-\frac{1}{2}$ (E) No such value exists

_____ 3. If $y=\dfrac{3x-4}{5x+7}$, then $\dfrac{dy}{dx}=$

(A) $\dfrac{30x-1}{(5x+7)^2}$ (B) $\dfrac{2x+3}{(5x+7)^2}$ (C) $-\dfrac{41}{(5x+7)^2}$ (D) $\dfrac{41}{(5x+7)^2}$ (E) $-\dfrac{1}{(5x+7)^2}$

_____ 4. $\lim\limits_{h\to 0}\dfrac{4\cos\left(\frac{3\pi}{2}+h\right)-4\cos\frac{3\pi}{2}}{h}=$ (A) -4 (B) 4 (C) 0 (D) -1 (E) DNE



Graph of f

_____ 5. The graph of a function f is shown above. At which value(s) of x is f not differentiable?

(A) a (B) a and b (C) a and d (D) b and d (E) a, b, and d

$$h(x)=\begin{cases}4x-3, & x\le 2\\ \frac{3}{2}x^2-2x+3, & x>2\end{cases}$$

_____ 6. Let g be the function given above. Which of the following statements are true about g ?

I. $\lim_{x\to 2} h(x)$ exists

II. h is continuous at $x=2$

III. h is differentiable at $x=2$

(A) None (B) I only (C) II only (D) I and II only (E) I, II, and III

_____ 7. Which of the following is the equation of the <u>normal line</u> to the function $f(x)=x^2+3x-5$ at $x=1$?

(A) $5x-y=-4$ (B) $x-5y=-4$ (C) $5x+y=-4$ (D) $x+5y=-4$ (E) $-5x+y=-4$

_____ 8. If $f(x)=x^2\sin(x)-\sqrt{x^3}$, then $f'(0)=$

(A) -2 (B) -1 (C) 0 (D) 1 (E) 2

_____ 9. If $f(x)=x^3+kx^2+x-3$, and if $f'(-2)=17$, then $k=$

(A) -2 (B) -1 (C) 0 (D) 1 (E) 2

Part Dos: Free Response—Do all work in the space provided. Show all steps. Use proper notation.

10. If $f(x)=\frac{2}{3}x^3+\frac{3}{2}x^2-x+5$

(a) Let $Q(x)=f'(x)$. Find $Q(x)$ and $Q'(x)$.

(b) Find $\lim_{x\to\infty}\frac{Q'(x)}{Q(x)}=$

(c) Find $Q(-2)$ and $Q'(-2)$.

(d) Find the equation of the tangent line, in Taylor Form, of $Q(x)$ at $x=-2$.

(e) Find the equation of the normal line, in Taylor Form, of $Q(x)$ at $x = -2$.

(f) The equation of the normal line to $Q(x)$ at $x = -2$ intersects the graph of $Q(x)$ at another x-value. Find this x-value. Show the work that leads to your answer.