AP Calculus BC Name: ______________________________ Period: _____

Unit 1 – Wkst 6 – AP-Style MC Problems – Limits, Continuity, IVT, Basic Derivatives and Rules

_____1. If f and g are twice differentiable and if $h(x) = f(g(x))$, then $h''(x) =$

(A) $f''(g(x))[g'(x)]^2 + f'(g(x))g''(x)$

(B) $f''(g(x))g'(x) + f'(g(x))g''(x)$

(C) $f''(g(x))[g'(x)]^2$

(D) $f''(g(x))$

_____2. If $f(x) = \begin{cases} \dfrac{\ln(8x)}{x} & \text{if } 0 < x \le 2 \\ x\ln x & \text{if } 2 < x \le 5 \end{cases}$, what is $\lim\limits_{x \to 2} f(x) =$

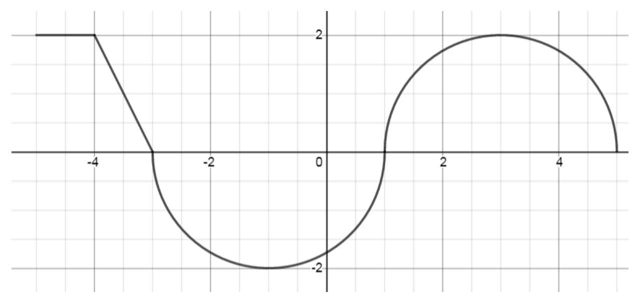
(A) $\ln 4$

(B) $\ln 8$

(C) $\ln 16$

(D) The limit does not exist.

_____3. The graph of the function g, shown on the right, is composed of two line segments and two semicircles. For what values of x, $-5 \le x \le 5$, is g not differentiable?



(A) -4, -1, and 3 only

(B) -4, -3, and 1 only

(C) -4, -3, -1, 1, and 3

(D) -4 and -3 only

_____4. Which of the following limits are equal to 0?

I. $\lim\limits_{x \to \infty} \left(\dfrac{5x^2 + 7x - 4}{3x^2 - 1} \right)$ II. $\lim\limits_{x \to \infty} \left(\dfrac{5x^3 - 4x - 10}{3x^4 + 3x} \right)$ III. $\lim\limits_{x \to \infty} \left(\dfrac{5x^2 - 4x + 3}{3x + 15} \right)$

(A) I and II only (B) II and III only (C) I only (D) II only

_____5. Which of the following equations has a horizontal asymptote of $y = 3$?

I. $y = \dfrac{2 + 4x - 6x^2}{1 - 8x + 2x^2}$ II. $y = \dfrac{3x^2 - 3x + 9}{x + 3}$ III. $y = \dfrac{2 + 4x - 6x^2}{1 - 8x - 2x^2}$

(A) I and III only (B) III only (C) II only (D) I, II, and III

______6. Which of the following is an equation of the line tangent to the graph of $f(x) = x^3 + 2x - 1$ at the point where $f'(x) = 2$?

(A) $y = 2x - 1$ (B) $y = 2x - 2$ (C) $y = 2x - 3$ (D) $y = 2x - 4$

______7. If $f(x) = \dfrac{2x^2 + 3}{3x - 2}$, then $f'(1) =$

(A) $\dfrac{4}{3}$ (B) 19 (C) -11 (D) $\dfrac{4}{9}$

______8. For values of h very close to 0, which of the following functions best approximates $g(x) = \dfrac{\sec(x+h) - \sec x}{h}$?

(A) $\sec x$ (B) $\dfrac{\sec x}{x}$ (C) $\tan^2 x$ (D) $\sec x \tan x$

______9. For what value(s) of k is $h(x)$ continuous, if $h(x) = \begin{cases} kx^2 + x, & x \le 3 \\ 4x + 4, & x > 3 \end{cases}$?

(A) $\dfrac{1}{2}$ (B) $\dfrac{7}{9}$ (C) $\dfrac{13}{9}$ (D) $\dfrac{4}{3}$ and -1

______10. If $g'(x) = -\dfrac{5}{x^2}$, what is $g''(e)$?

(A) $10e^3$ (B) $-5e^{-3}$ (C) $\dfrac{10}{e^3}$ (D) $-10e^{-3}$

______11. What is the slope of the tangent line to the graph of $y = \cos^3(2x)$?

(A) $3\sin^2(2x)$

(B) $-6\cos^2(2x)\sin(2x)$

(C) $3\cos(2x)\sin(2x)$

(D) $-3\cos^2(2x)\sin(2x)$

______12. $\lim_{x\to 4}\frac{x-4}{x^3-64}=$

(A) $\frac{1}{48}$ (B) $\frac{1}{16}$ (C) $\frac{1}{64}$ (D) The limit does not exist.

______13. Which of the following is equivalent to $\frac{\pi}{2}$?

I. $\lim_{x\to -\infty}(\arctan x)$ II. $\lim_{x\to \infty}(\operatorname{arcsec} x)$ III. $\lim_{x\to \infty}(\arctan x)$

(A) I and II only
(B) III only
(C) II and III only
(D) I, II, and III

______14. The graph of $f(x)=\frac{x^3+x^2-6x}{x^2-4}$ has

(A) an infinite discontinuity at $x=2$
(B) a removable discontinuity at $x=2$
(C) a horizontal asymptote at $y=0$
(D) a vertical asymptote at $x=2$

______15. Let $H(x)=\begin{cases}\frac{3x^2-12}{x+2} & , x\neq -2\\ x^2-2x-20 & , x=-2\end{cases}$. Which of the following statements is true?

I. $\lim_{x\to -2}H(x)$ exists II. $H(-2)$ exists III. H is continuous at $x=-2$

(A) I only (B) II only (C) I and II only (D) I, II, and III

______16. If $y=\cot(x^2)$, find $\frac{dy}{dx}$.

(A) $-\csc(2x)\cot(2x)$ (B) $-\csc^2(2x)$
(C) $-2x\csc(2x)\cot(2x)$ (D) $-2x\csc^2(x^2)$

______17. If w, u, and v are functions of x, and $h(x)=\frac{uv}{w}$, what is $h'(x)$?

(A) $\frac{u'v'}{w'}$ (B) $\frac{u'v+v'u}{w'}$ (C) $\frac{w'uv-u'vw-v'uw}{w^2}$ (D) $\frac{u'vw+v'uw-w'uv}{w^2}$

______18. If f is a continuous function on the closed interval $a \le x \le b$, and $f(a) < f(b)$ which of the following must be true?

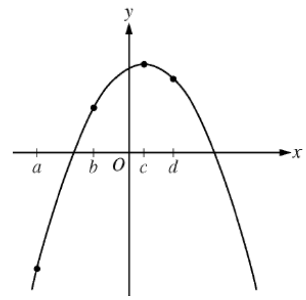
(A) There exists a number c, with $a < c < b$, such that $a < f(c) < b$.

(B) There exists a number c, with $a < c < b$, such that $f(a) < f(c) < f(b)$.

(C) There exists a number c, with $a < c < b$, such that $f(a) < c < f(b)$.

(D) There exists a number c, with $a \le c \le b$, such that $f(c) \ge f(b)$.

______19. The graph of $g(x)$ is shown in the figure on the right. Which of the following has the greatest value?



(A) $g'(a)$ (B) $g'(b)$ (C) $g'(c)$ (D) $g'(d)$

______20. If the function f is continuous at $x = 3$, which of the following statements must be true?

(A) $f(3) < \lim_{x \to 3} f(x)$

(B) $\lim_{x \to 3^-} f(x) \ne \lim_{x \to 3^+} f(x)$

(C) The derivative of f at $x = 3$ exists.

(D) $f(3) = \lim_{x \to 3^-} f(x) = \lim_{x \to 3^+} f(x)$

______21. Let f be the function defined by $f(x) = \sqrt{|x-2|}$ for all x. Which of the following statements is true?

(A) f is continuous but not differentiable at $x = 2$.

(B) f is differentiable at $x = 2$.

(C) f is not continuous at $x = 2$.

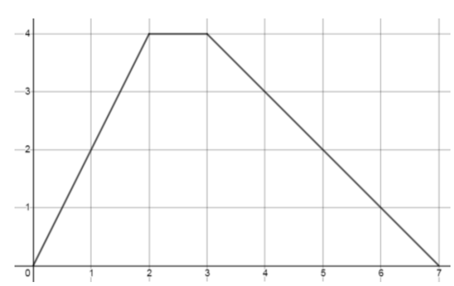
(D) $\lim_{x \to 2} f(x) \ne 0$

______22. If $y = \frac{1}{3}x^{3/4} - \frac{5}{x^3}$, then $\frac{dy}{dx} =$

(A) $\frac{1}{4x^{1/4}} + \frac{15}{x^2}$ (B) $\frac{1}{4x^{1/4}} + \frac{15}{x^4}$ (C) $\frac{1}{4x^{1/4}} + \frac{5}{3x^2}$ (D) $\frac{x^{1/4}}{4} + \frac{15}{x^4}$

______23. The graph of the function g, consisting of three line segments, is shown in the figure on the right. Let f be the function given by $f(x) = 3x - 2$. If $h(x) = g(f(x))$, then $h'(2) =$

(A) -3 (B) -1 (C) 3 (D) DNE



Graph of g