Name: _____ Class: 4+1 Date: _____ ID: G

PCH Calculus 1

Multiple Choice
Identify the choice that best completes the statement or answers the question.

Limits

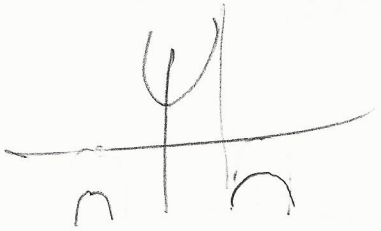
1. Let $f(x) = \begin{cases} ax+1, & \text{if } x < 2 \\ x^2, & \text{if } x \geq 2 \end{cases}$

find the value of a for which $\lim_{x \to 2} f(x)$ exists.

a. $-\frac{3}{2}$
b. $\frac{2}{3}$
c. 3
d. $\frac{3}{2}$
e. $-\frac{2}{3}$
f. none of these

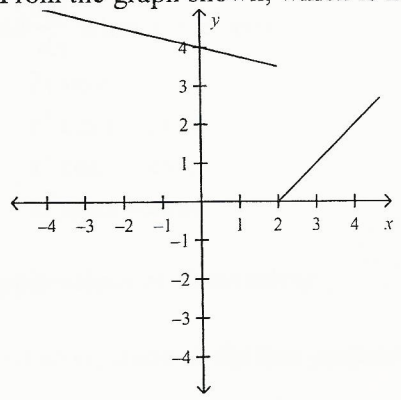
2. $\lim_{x \to \frac{\pi}{2}^-} \sec x =$

a. $-\infty$
b. -1
c. $\frac{\pi}{2}$
d. $-\frac{\pi}{2}$
e. 1
f. ∞
g. none of these



Name: _____ ID: G

3. From the graph shown, which is necessarily true:



I. $\lim_{x \to 2^-} f(x)$ does not exist.

II. $\lim_{x \to 2^+} f(x) = 0$

III. $\lim_{x \to 2} f(x) = 0$

a. III only
b. I only
c. I, II and III
d. none are true.
e. II only
f. I and II only
g. II and III only

4. $\lim_{x \to 1^-} \frac{x^3 - 1}{x - 1} =$

a. 1
b. -1
c. does not exist
d. $-\frac{1}{3}$
e. -3
f. $\frac{1}{3}$
g. 3
h. none of these

Name: _____ ID: G

5. $\lim_{h\to 0} \frac{\sqrt[3]{8-h}-2}{h} =$

a. $-\frac{1}{8}$
b. $-\frac{1}{12}$
c. $\frac{1}{12}$
d. $-\frac{1}{4}$
e. $\frac{1}{4}$
f. $\frac{1}{8}$
g. does not exist
h. none of these

6. $\lim_{x\to 0} \ln\left(\frac{\sin x}{x}\right) =$

a. 2
b. -2
c. 0
d. -1
e. does not exist
f. 1
g. e
h. none of these

7. $\lim_{x\to 0} \frac{\sin 3x}{x} =$

a. -3
b. 3
c. $-\frac{1}{3}$
d. $\frac{1}{3}$
e. does not exist
f. none of these

8. $\lim_{x\to 0} \frac{\sin\left(\frac{\pi}{6}+h\right)-\frac{1}{2}}{h} =$

a. $-\frac{1}{2}$
b. 1
c. $-\frac{\sqrt{3}}{2}$
d. does not exist
e. -1
f. $\frac{1}{2}$
g. $\frac{\sqrt{3}}{2}$
h. none of these

Name: _____ ID: G

9. $\lim_{x \to 4} \frac{x-4}{|x-4|} =$

a. 2
b. -1
c. 1
d. 0
e. does not exist
f. $\frac{1}{4}$
g. -2
h. none of these

10. $\lim_{x \to 2^-} \frac{1}{x-2} =$

a. $-\frac{1}{4}$
b. 1
c. ∞
d. $\frac{1}{4}$
e. -1
f. $-\infty$
g. none of these

11. $\lim_{h \to 0} \frac{\ln(1+h) - \ln 1}{h} =$

$\ln x \quad f'(1) \quad \frac{1}{1}$

a. -1
b. 2
c. 1
d. e
e. 0
f. does not exist

12. $\lim_{h \to 0} \frac{\frac{1}{\sqrt{4+h}} - \frac{1}{2}}{h} =$

$\frac{1}{\sqrt{x}} \quad f'(4) \quad x^{-\frac{1}{2}}$

a. -16
b. 16
c. does not exist
d. $-\frac{1}{4}$
e. $\frac{1}{16}$
f. $\frac{1}{4}$
g. $-\frac{1}{16}$
h. none of these

$-\frac{1}{2\sqrt[2]{x^3}}$

$-\frac{1}{2\sqrt{64}}$

$-\frac{1}{16}$

Name: _____

13. $\lim_{h\to 0} \dfrac{\cos^2\left(\frac{\pi}{4}+h\right)-\cos^2\left(\frac{\pi}{4}\right)}{h} =$

a. does not exist
b. $\sqrt{2}$
c. $\dfrac{\sqrt{2}}{2}$
d. $-\dfrac{\sqrt{2}}{2}$
e. -1
f. 1
g. $-\sqrt{2}$
h. none of these

$\cos^2(x)\, f'\left(\frac{\pi}{4}\right)$

$2\cos(x)\cdot -\sin(x)$

$-2\sin(x)\cos(x)$

$-2\left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{2}}{2}\right)$

-1

Derivatives

14. Find $\dfrac{dy}{dx}$ when $y = \ln\left(e^x - 1\right)$

a. $\dfrac{e^x}{e^x-1}$
b. $e^x - 1$
c. $\dfrac{e^x}{e^x+1}$
d. $\dfrac{2e^x}{1-e^x}$
e. e^x
f. $\dfrac{-e^x}{e^x-1}$
g. $-\dfrac{e^x}{e^x+1}$
h. none of these

$\dfrac{1}{e^x-1}\cdot e^x$

15. Find $\dfrac{dy}{dx}$ when $y = \dfrac{x^2-1}{1-2x}$

a. $\dfrac{-2\left(x^2-x+1\right)}{(1-2x)^2}$
b. $\dfrac{-\left(x^2-x+1\right)}{(1-2x)^2}$
c. $-\dfrac{2}{(1-2x)^2}$
d. $\dfrac{2}{(1-2x)^2}$
e. 2x-1
f. $\dfrac{x^2+2x-1}{(1-x)^2}$
g. $\dfrac{2\left(x^2-x+1\right)}{(1-2x)^2}$
h. none of these

$\dfrac{(1-2x)(2x)-(x^2-1)(-2)}{(1-2x)^2} = \dfrac{(-4x^2+2x)-(-2x^2+2)}{(1-2x)^2}$

$\dfrac{-2x^2+2x-2}{(1-2x)^2}$

$\dfrac{-2(x^2-x+1)}{(1-2x)^2}$

Name: _____ ID: G

16. Find $\frac{dy}{dx}$ when $y = \sqrt{\tan 5x}$

a. $\frac{-1}{2\sqrt{\tan 5x}}$

b. $\frac{5\sec^2 5x}{2\sqrt{\tan 5x}}$

c. $\frac{1}{2\sqrt{\tan 5x}}$

d. $\frac{-5}{2\sqrt{\tan 5x}}$

e. $\frac{5}{2\sqrt{\tan 5x}}$

f. $\frac{5\sec 5x}{2\sqrt{\tan 5x}}$

g. $\frac{\sec^2 5x}{2\sqrt{\tan 5x}}$

h. none of these

17. Find $\frac{dy}{dx}$ when $y = \frac{\cos x}{1-\sin x}$ at $x = \frac{3\pi}{4}$

a. $\frac{-2}{2+\sqrt{2}}$

b. $\frac{2-\sqrt{2}}{2}$

c. $\frac{\sqrt{2}}{2}$

d. $\frac{2+\sqrt{2}}{2}$

e. $-\frac{\sqrt{2}}{2}$

f. $\frac{2}{2-\sqrt{2}}$

g. $\frac{2}{2+\sqrt{2}}$

h. none of these

18. Find $\frac{dy}{dx}$ when $y = 5\sqrt{x} - \frac{10}{x^2} + \frac{1}{2\sqrt{x}}$

a. $\frac{5}{2}x^{-\frac{1}{2}} + 20x^{-3} - \frac{1}{4}x^{-\frac{3}{2}}$

b. $\frac{5}{2}x^{-\frac{1}{2}} + 20x^{-3} + \frac{1}{4}x^{-\frac{3}{2}}$

c. $\frac{5}{2}x^{-\frac{1}{2}} - 20x^{-3} - \frac{1}{4}x^{-\frac{3}{2}}$

d. $\frac{5}{2}x^{-\frac{1}{2}} + 20x^{-3} - \frac{1}{4}x^{-\frac{1}{2}}$

e. $\frac{5}{2}x^{-\frac{1}{2}} + 10x^{-3} - \frac{1}{4}x^{-\frac{3}{2}}$

f. $\frac{5}{2}x^{-\frac{1}{2}} - 10x^{-3} + \frac{1}{4}x^{-\frac{3}{2}}$

g. $\frac{2}{5}x^{-\frac{1}{2}} + 20x^{-3} - 4x^{\frac{3}{2}}$

h. none of these

Name: _____ ID: G

19. $\frac{d}{dx}\left(\frac{1+\cos x}{\cos x-1}\right) =$

a. $\frac{-\cos x}{(\cos x-1)^2}$

b. $\frac{-2\sin x}{(\cos x-1)^2}$

c. $\frac{2\sin x}{(\cos x-1)^2}$

d. $\frac{-2\sin x}{(1-\cos x)^2}$

e. $\frac{2\sin x}{(\cos x+1)^2}$

f. $\frac{-\sin x}{(\cos x-1)^2}$

g. $\frac{2\sin x}{(1-\cos x)^2}$

h. none of these

20. $\frac{d}{dx}\left(3x^2+4\right)^{-5} =$

a. $\frac{-30x}{\left(3x^2+4\right)^6}$

b. $\frac{30x}{\left(3x^2+4\right)^6}$

c. $\frac{10x}{\left(3x^2+4\right)^4}$

d. $\frac{30x}{\left(3x^2+4\right)^4}$

e. $\frac{-10x}{\left(3x^2+4\right)^6}$

f. $\frac{10x}{\left(3x^2+4\right)^6}$

g. $\frac{-30x}{\left(3x^2+4\right)^4}$

h. none of these

21. Find $\frac{dy}{dx}$ when $y = \frac{x^2+5x-1}{x^2}$

a. $-\frac{5}{x^3}+\frac{2}{x^2}$

b. $\frac{2x-5}{2x}$

c. $-\frac{5}{x^2}+\frac{2}{x^3}$

d. $-\frac{5}{x^2}-\frac{2}{x^3}$

e. $\frac{5}{x^2}-\frac{2}{x^3}$

f. $\frac{2x+5}{2x}$

g. $\frac{5}{x^2}+\frac{2}{x^3}$

h. none of these

Name: _____ ID: G

$x^2\cos x + 2x\sin x$

22. Find $\frac{dy}{dx}$ when $y = x^2 \sin x$

a. $2x\sin x$
b. $x^2\cos x - 2x\sin x$
c. $x^2\cos x + x\sin x$
d. $x^2\cos x - x\sin x$
e. $2x\cos x$
f. $x\cos x - x\sin x$
g. $x^2\cos x + 2x\sin x$
h. none of these

Applications of Derivatives

23. Find an equation of the line perpendicular to the tangent to the graph of $f(x) = x^3 - 3x + 1$ at the point (2,3).

a. $y - 2 = 9(x - 3)$
b. $y - 3 = 9(x - 2)$
c. $y - 2 = \frac{1}{9}(x - 3)$
d. $y - 3 = \frac{1}{9}(x - 2)$
e. $y - 3 = -\frac{1}{9}(x - 2)$
f. $y - 2 = -\frac{1}{9}(x - 3)$
g. $y - 3 = -9(x - 2)$
h. none of these

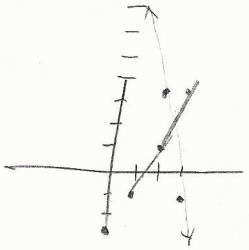
$3x^2 - 3$

$\frac{-1}{3x^2 - 3}$ m_{norm}

$m = -\frac{1}{12 - 3} = -\frac{1}{9}$

24. Suppose that u and v ar function of x that are differentiable at x = 2 and that u(2) = 3, u'(2) = -4, v(2) = 1 and v'(2) = 2. Find the values of $\frac{d}{dx}(uv)$ at x = 2.

a. -2
b. 6
c. 1
d. 2
e. -8
f. 8
g. -6
h. none of these



$V = 2x - 3$

$u = -4x + 11$

$(2x - 3)(-4x + 11)$

$(-8x^2 + 22x + 12x - 33)$

25. Find the slope of the normal line to $h(x) = 2\sin(4x)$ when $x = \frac{\pi}{12}$

a. -1
b. 2
c. -4
d. $\frac{1}{4}$
e. 1
f. $\frac{1}{4}$
g. 4
h. none of these

$2\cos(4x)$

$2\cos\left(\frac{\pi}{3}\right)$

$f'(x) = -16x + 34$

$m_{tan} = 4$

$m_{norm} = -\frac{1}{4}$

Student Grade Report

Legend: Incorrect: ☐

Student: Vestil, Keanu

	Grade	Total Score	Score (%)
Overall	B	21.00 / 25.00	84.00

Responses

Question	Response	Correct Answer
Question1	C	D
Question2	F	
Question3	E	
Question4	G	
Question5	C	
Question6	C	
Question7	F	B
Question8	G	
Question9	E	

Question	Response	Correct Answer
Question10	F	
Question11	C	
Question12	G	
Question13	E	
Question14	A	
Question15	A	
Question16	B	
Question17	E	F
Question18	A	

Question	Response	Correct Answer
Question19	C	
Question20	A	
Question21	H	C
Question22	G	
Question23	E	
Question24	D	
Question25	D	