AMI—AP Calculus: Day 1

1. $\lim_{x\to 2} \frac{x^2-4}{x^2+4}$ is

2. $\lim_{x\to \infty} \frac{4-x^2}{x^2-1}$ is

3. $\lim_{x\to 3} \frac{x-3}{x^2-2x-3}$ is

4. $\lim_{x\to 0} \frac{x}{x}$ is

5. $\lim_{x\to 2} \frac{x^3-8}{x^2-4}$ is

6. $\lim_{x\to \infty} \frac{4-x^2}{4x^2-x-2}$ is

7. $\lim_{x\to -\infty} \frac{5x^3+27}{20x^2+10x+9}$ is

8. $\lim_{x\to \infty} \frac{3x^2+27}{x^3-27}$ is

9. $\lim_{x\to \infty} \frac{2^{-x}}{2^x}$ is

AMI— AP Calculus: Day 2

19. Evaluate $\lim_{x\to 4}\dfrac{\sqrt{x+5}-1}{x+4}$ using the conjugate method.

20. Evaluate the limit of $g(x)=\dfrac{x^2-11x+24}{x^2-2x-3}$ as x approaches each value for which $g(x)$ is undefined.

21. Evaluate the following limits:

    (a) $\lim_{x\to-\infty}\dfrac{9-x^2}{5+7x-3x^2}$

    (b) $\lim_{x\to\infty}\dfrac{4x^3+6x^2}{19x^2-5x+2}$

    (c) $\lim_{\theta\to 0}\dfrac{1-\cos 4\theta}{\theta}$

22. Determine whether or not the function $f(x)$, as defined below, is continuous at $x = 4$:

$$f(x)=\begin{cases}\dfrac{4x^2-13x-12}{x-4} & ,x\neq 4\\ 19 & ,x=4\end{cases}$$

23. Find the value of c that makes the function $g(x)$ everywhere continuous:

$$g(x)=\begin{cases}x^2+3x-5 & ,x\leq 1\\ x-c & ,x>1\end{cases}$$

24. Find all the x-values for which the function $h(x)=\dfrac{x^2-12x+35}{2x^2-13x-7}$ is discontinuous and classify each instance of discontinuity.

25. Does the Intermediate Value Theorem guarantee the following function values for $f(x) = 3x^2 - 12x + 4$ on the closed interval [0,5]? Why or why not?

    (a) 10

    (b) 20

26. Use the difference quotient to find the derivative of $f(x) = x^3 - 2x$ and use it to evaluate $f'(-3)$.

27. Determine $g'(1)$ if $g(x) = 3x^2 - 8x + 2$ using the alternative formula for the difference quotient.

AMI— AP Calculus: Day 3

28. Find the derivative of each expression with respect to x:
    (a) $2x^5+6x^4-7x^3+\frac{1}{5}x^2-x+9$
    (b) $(3x^2+4)(9x-5)$
    (c) $\frac{2x^2+1}{x^2-4}$
    (d) $(x^2-7x+2)^{10}$
    (e) $\sqrt{x^3}(2x-3)^4$
29. Given the function $h(x) = 3x^4 - 9x^2 + 2$, calculate the following values:
    (a) The average rate of change of $h(x)$ on the x-interval $[-1,3]$.
    (b) The instantaneous rate of change of $h(x)$ when $x = 2$.
30. Given $f(x) = \tan(\cos x)$, calculate $f'\left(\frac{3\pi}{2}\right)$.
31. Find the equation of the tangent line to $f(x) = x^2 \sin x$ when $x = \pi$. *Hint: Use the Product Rule to differentiate $f(x)$.*
32. Find the slope of the tangent line to the graph of $x^2 - 7xy - 4y^2 + y - 9 = 0$ at the point $(-3,0)$.

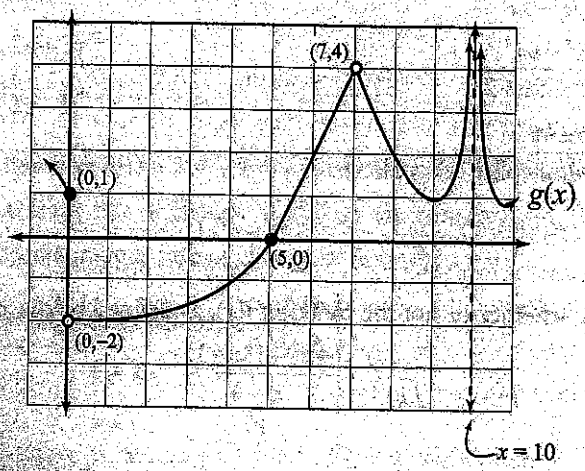
10. $\lim_{x\to-\infty}\frac{2^{-x}}{2^x}$ is

11. $\lim_{x\to0}\frac{\sin 5x}{x}$

12. $\lim_{x\to0}\frac{\sin 2x}{3x}$

AMI— AP Calculus: Day 4

16. Evaluate the limits on the graph pictured below:



(a) $\lim_{x \to 10^-} g(x)$

(b) $\lim_{x \to 7} g(x)$

(c) $\lim_{x \to 0} g(x)$

(d) $\lim_{x \to 5} g(x)$

17. Evaluate the limits using substitution:

(a) $\lim_{x \to \pi/4} (x \sin x)$

(b) $\lim_{x \to 2a} (x^2 - 3x + 1)$

18. Evaluate the limits using the factoring method:

(a) $\lim_{x \to -(3/2)} \dfrac{2x^2 + 7x + 6}{2x + 3}$

(b) $\lim_{x \to -1} \dfrac{3x^2 + 11x - 4}{5x^2 + 23x + 12}$

AMI— AP Calculus: Day 5

13. The graph of $y = \arctan x$ has

(A) vertical asymptotes at $x = 0$ and $x = \pi$

(B) horizontal asymptotes at $y = \pm\frac{\pi}{2}$

(C) horizontal asymptotes at $y = 0$ and $y = \pi$

(D) vertical asymptotes at $x = \pm\frac{\pi}{2}$

(E) no asymptotes

14. The graph of $y = \frac{x^2 - 9}{3x - 9}$ has

(A) a vertical asymptote at $x = 3$

(B) a horizontal asymptote at $y = \frac{1}{3}$

(C) a removable discontinuity at $x = 3$

(D) an infinite discontinuity at $x = 3$

(E) no asymptotes or discontinuities

15. $\lim_{x \to 0} \frac{\sin x}{x^2 + 3x}$ is

16. $\lim_{x \to 0} \sin\frac{1}{x}$ is

17. Which statement is true about the curve $y = \frac{2x^2 + 4}{2 + 7x - 4x^2}$?

(A) The line $x = -\frac{1}{4}$ is a vertical asymptote.

(B) The line $x = 1$ is a vertical asymptote.

(C) The line $y = -\frac{1}{4}$ is a horizontal asymptote.

(D) The graph has no vertical or horizontal asymptote.

(E) The line $y = 2$ is a horizontal asymptote.

18. $\lim_{x \to 0} \frac{2x^2 + 1}{(2-x)(2+x)} =$

19. $\lim_{x \to 0} \frac{|x|}{x} =$

20. $\lim_{x \to \infty} x \sin\left(\frac{1}{x}\right) =$

21. $\lim_{x \to \pi} \frac{\sin(\pi - x)}{(\pi - x)}$