

Summer 2026 AP Calculus BC

Welcome to AP Calculus BC! I am looking forward to having a second year of calculus with you all. We will be reviewing Units 1- 8 from Calculus AB with some new topics added, then adding new Units 9 and 10.

The pace of calculus BC will be **fast**. To help you start the year successfully, please review the topics below before the year begins. This review is a recommended review, not mandatory, but doing it will help us start the year running.

This summer work is designed to help you review the first few topics we will study:

- Limits: tables, graphs, expressions
- Continuity
- Finding equations of tangent lines
- Derivatives
 - Power rule
 - Product rule
 - Quotient rule
 - Chain rule

Attached is a pdf of a Delta Math assignment. The Delta Math time estimate for this assignment is 83 minutes, so you should easily finish in 2 hours total.

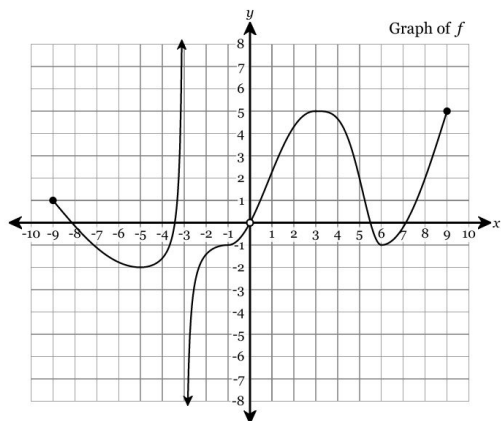
If you need refreshers on any topic, please refer to Khan Academy: www.khanacademy.org or any other source you like.

If you have any questions, email me at coslund@saintjohnsprep.org.

Looking forward to seeing you in August!

Mrs. Oslund

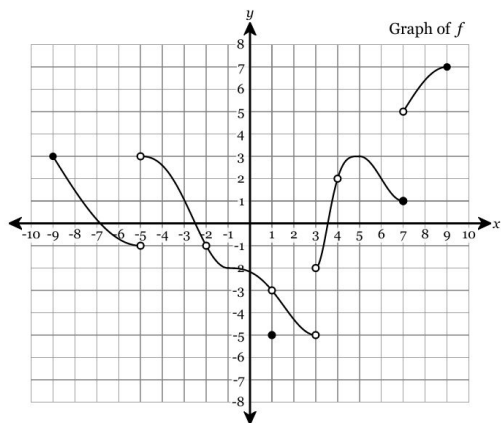
1. Answer all of the questions below about the function $f(x)$ graphed below when $x = -3$. Write dne and undefined to reference values that do not exist or are undefined.



$$\lim_{x \rightarrow -3^-} f(x) = \underline{\hspace{2cm}} \quad \lim_{x \rightarrow -3^+} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -3} f(x) = \underline{\hspace{2cm}} \quad f(-3) = \underline{\hspace{2cm}}$$

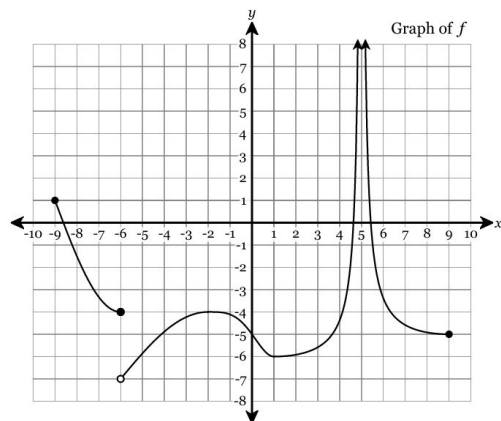
2. Answer all of the questions below about the function $f(x)$ graphed below when $x = 4$. Write dne and undefined to reference values that do not exist or are undefined.



$$\lim_{x \rightarrow 4^-} f(x) = \underline{\hspace{2cm}} \quad \lim_{x \rightarrow 4^+} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow 4} f(x) = \underline{\hspace{2cm}} \quad f(4) = \underline{\hspace{2cm}}$$

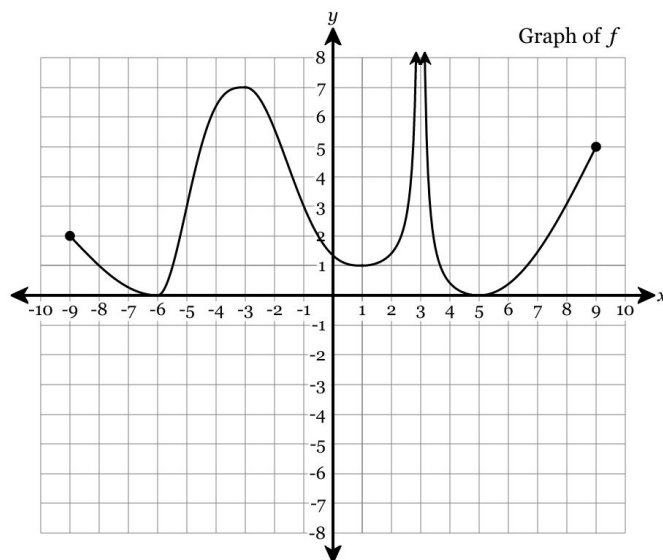
3. Answer all of the questions below about the function $f(x)$ graphed below when $x = -6$. Write dne and undefined to reference values that do not exist or are undefined.



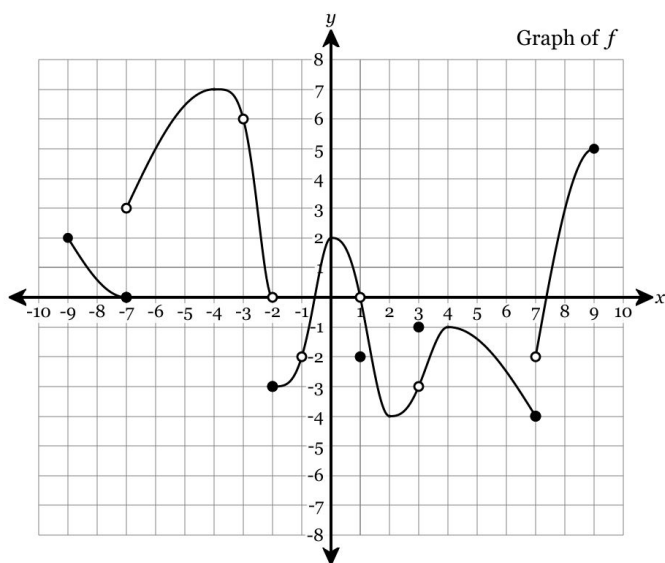
$$\lim_{x \rightarrow -6^-} f(x) = \underline{\hspace{2cm}} \quad \lim_{x \rightarrow -6^+} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -6} f(x) = \underline{\hspace{2cm}} \quad f(-6) = \underline{\hspace{2cm}}$$

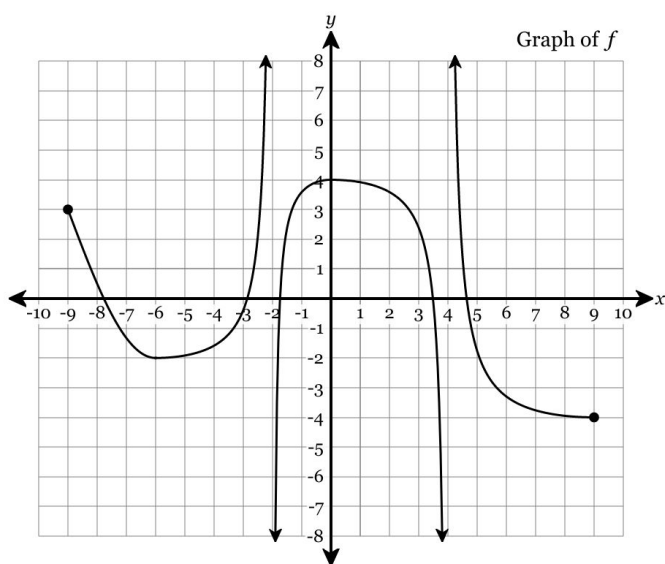
4. Use the graph of the function $f(x)$ shown below in order to determine $\lim_{x \rightarrow 1^+} f(x)$. If the limit does not exist, write DNE.



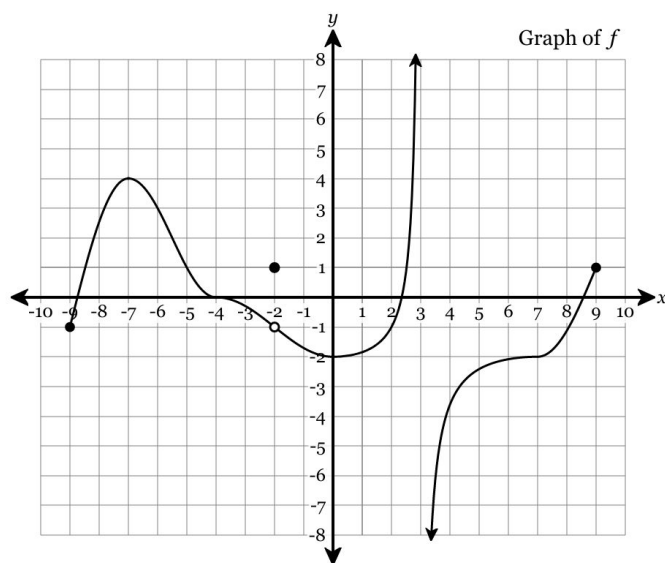
5. Use the graph of the function $f(x)$ shown below in order to determine $\lim_{x \rightarrow -2^-} f(x)$. If the limit does not exist, write DNE.



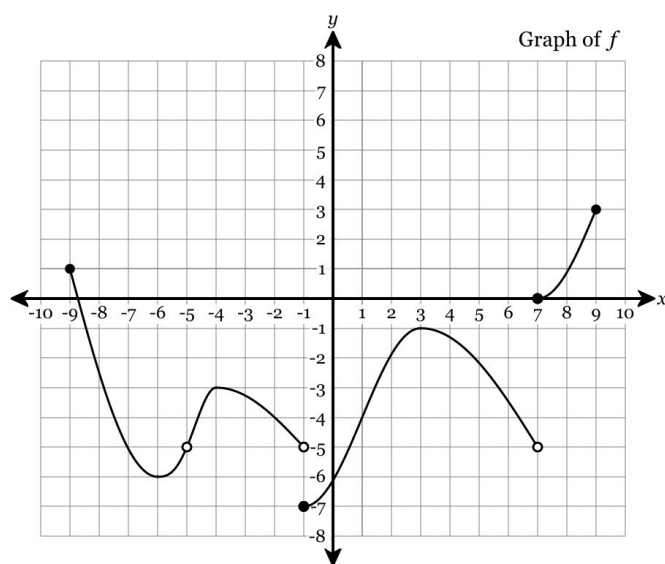
6. Use the graph of the function $f(x)$ shown below in order to determine $\lim_{x \rightarrow 4} f(x)$. If the limit does not exist, write DNE.



7. Use the graph of the function $f(x)$ shown below in order to determine $\lim_{x \rightarrow -2^+} f(x)$. If the limit does not exist, write DNE.



8. Use the graph of the function $f(x)$ shown below in order to determine $\lim_{x \rightarrow -5} f(x)$. If the limit does not exist, write DNE.



9. Determine whether the function $f(x)$ is continuous at $x = 4$.

$$f(x) = \begin{cases} 2 + x^2, & x < 4 \\ 14 + x, & x \geq 4 \end{cases}$$

- A. $f(x)$ is discontinuous at $x = 4$
 B. $f(x)$ is continuous at $x = 4$

10. Determine whether the function $f(x)$ is continuous at $x = -3$.

$$f(x) = \begin{cases} 4 - 3x^2, & x < -3 \\ -17 + 2x, & x \geq -3 \end{cases}$$

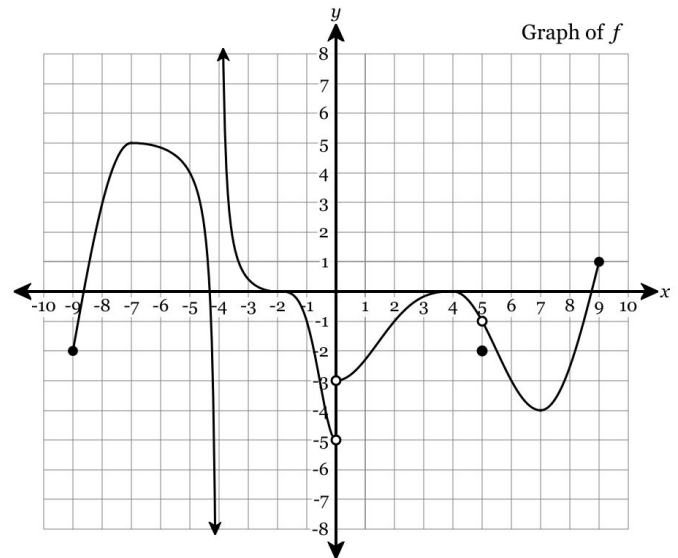
- A. $f(x)$ is discontinuous at $x = -3$
 B. $f(x)$ is continuous at $x = -3$

11. Determine whether the function $f(x)$ is continuous at $x = 2$.

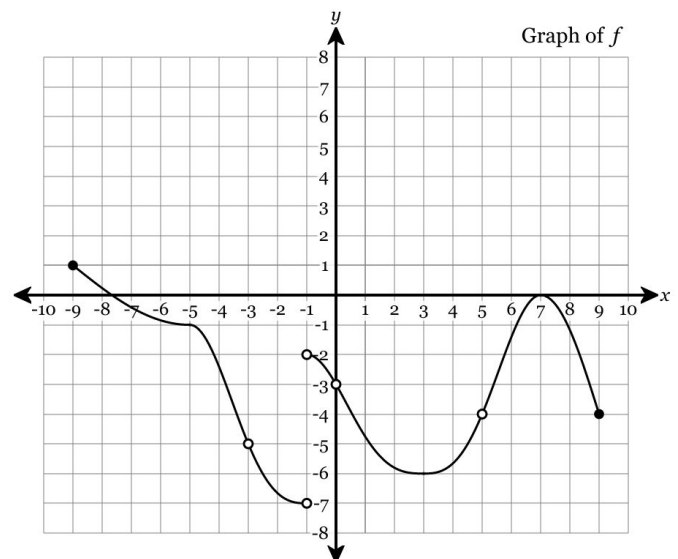
$$f(x) = \begin{cases} 13 + 2x^2, & x \geq 2 \\ 18 + 2x, & x < 2 \end{cases}$$

- A. $f(x)$ is discontinuous at $x = 2$
 B. $f(x)$ is continuous at $x = 2$

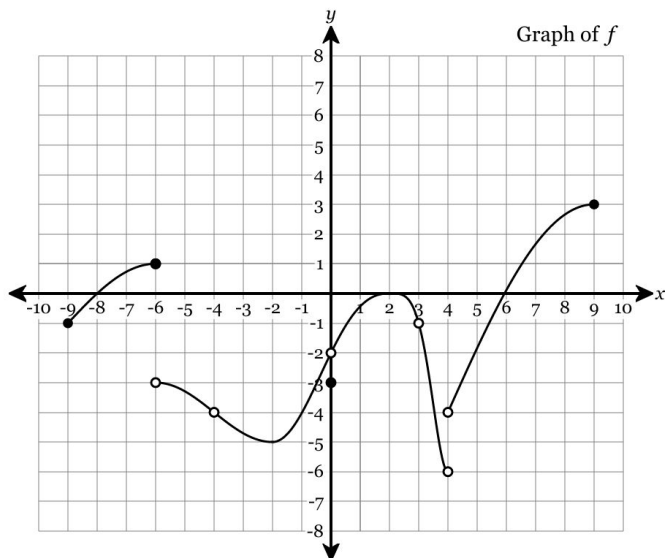
12. The graph of the function $f(x)$ is shown below. State all values of x in the open interval $-9 < x < 9$ for which the function has an infinite discontinuity.



13. The graph of the function $f(x)$ is shown below. State all values of x in the open interval $-9 < x < 9$ for which the function has a removable discontinuity.



14. The graph of the function $f(x)$ is shown below. State all values of x in the open interval $-9 < x < 9$ for which the function has a jump discontinuity.



15. For the function $f(x)$ shown below, determine $\lim_{x \rightarrow -3} f(x)$. If the limit does not exist, write DNE.

$$f(x) = \begin{cases} -x^2 + 6 & \text{for } x < -3 \\ 9 + 4x & \text{for } x \geq -3 \end{cases}$$

16. Determine the limit shown below in simplest form.

$$\lim_{x \rightarrow -2} \frac{-2x - 4}{x^2 + 2x}$$

17. Determine the limit shown below in simplest form.

$$\lim_{x \rightarrow -5} \frac{x^2 - 25}{x^2 + 4x - 5}$$

18. Determine the limit shown below in simplest form.

$$\lim_{x \rightarrow -6} \frac{x^2 + 10x + 24}{5x + 30}$$

19. Determine the limit shown below in simplest form.

$$\lim_{x \rightarrow -2} \frac{x^2 - 4}{4x + 8}$$

20. Determine the following limit in simplest form. If the limit is infinite, state that the limit does not exist (DNE).

$$\lim_{x \rightarrow \infty} \frac{63x^4 + 14x}{-12x^2 + 27x^4 - 4}$$

21. Determine the following limit in simplest form. If the limit is infinite, state that the limit does not exist (DNE).

$$\lim_{x \rightarrow \infty} \frac{12 + 16x^2 + 3x^3 + 4x^5}{40x^3 - 15 - 16x^5 + 6x^2}$$

22. Determine the following limit in simplest form. If the limit is infinite, state that the limit does not exist (DNE).

$$\lim_{x \rightarrow \infty} \frac{-6x(6 + x)}{(7 + 5x)(8x + 3)}$$

23. Determine the following limit in simplest form. If the limit is infinite, state that the limit does not exist (DNE).

$$\lim_{x \rightarrow \infty} \frac{2x^3 - 9x^4}{49x - 21x^4 + 21 - 9x^3}$$

24. Determine whether the following limit is equal to ∞ , $-\infty$ or some specific value.

$$\lim_{x \rightarrow -\infty} (e^{-x+2})$$

25. Determine whether the following limit is equal to ∞ , $-\infty$ or some specific value.

$$\lim_{x \rightarrow \infty} \frac{3x^3 + 6}{5x^2 + e^x}$$

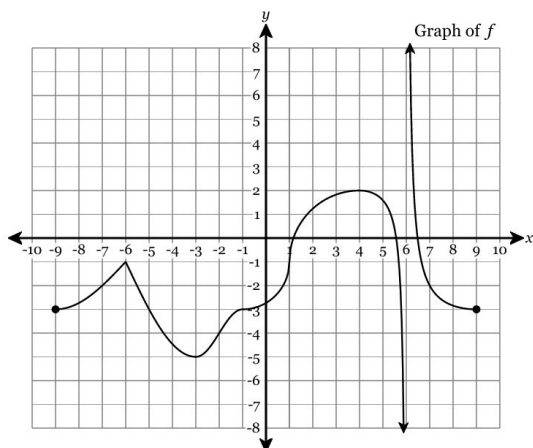
26. Determine whether the following limit is equal to ∞ , $-\infty$ or some specific value.

$$\lim_{x \rightarrow -\infty} \frac{3x^3 - 4}{3x^3 - e^x}$$

27. Determine whether the following limit is equal to ∞ , $-\infty$ or some specific value.

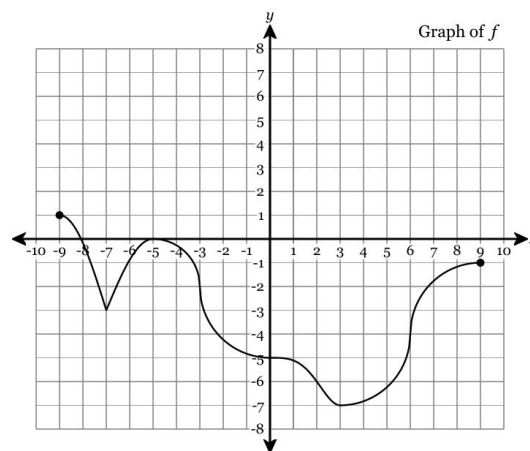
$$\lim_{x \rightarrow -\infty} (6 - 5x) e^x$$

28. The graph of the function f is shown below. If m is the slope of the line tangent to the graph of f at $x = 8$, which statement best describes the value of m ?



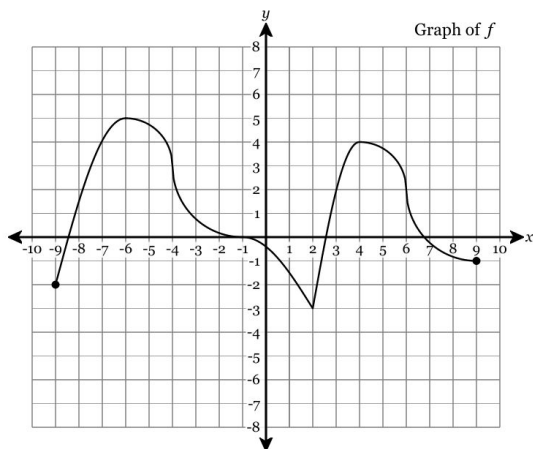
- A. $m = 0$
- B. $0 < m < 1$
- C. $m > 1$
- D. $-1 < m < 0$
- E. $m < -1$
- F. undefined
- G. there is no tangent line

29. The graph of the function f is shown below. Which statement best describes the value of $f'(-8)$?



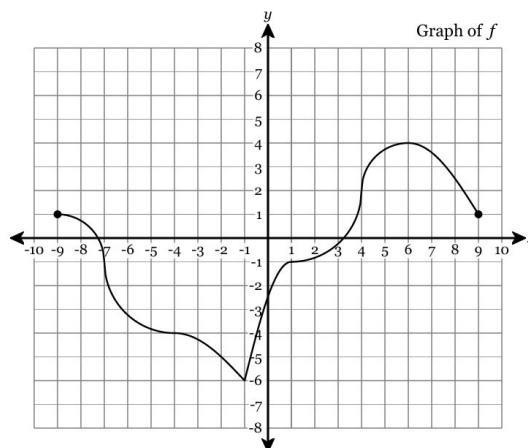
- A. $f'(-8) = 0$
- B. $0 < f'(-8) < 1$
- C. $f'(-8) > 1$
- D. $-1 < f'(-8) < 0$
- E. $f'(-8) < -1$
- F. $f'(-8)$ does not exist

30. The graph of the function f is shown below. If m is the slope of the line tangent to the graph of f at $x = -6.25$, which statement best describes the value of m ?



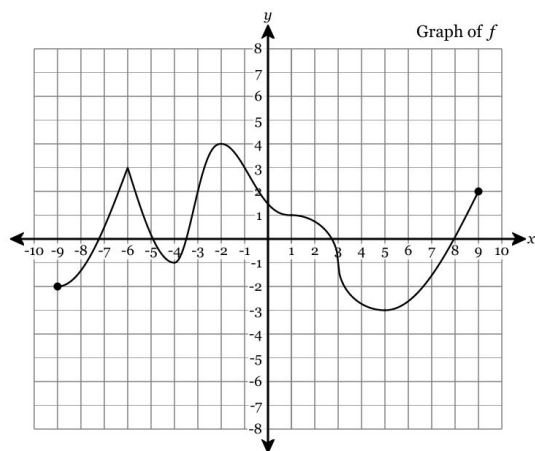
- A. $m = 0$
- B. $0 < m < 1$
- C. $m > 1$
- D. $-1 < m < 0$
- E. $m < -1$
- F. undefined
- G. there is no tangent line

31. The graph of the function f is shown below. If m is the slope of the line tangent to the graph of f at $x = 2$, which statement best describes the value of m ?



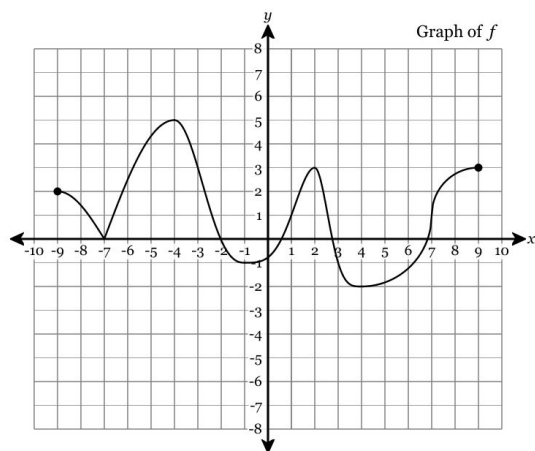
- A. $m = 0$
- B. $0 < m < 1$
- C. $m > 1$
- D. $-1 < m < 0$
- E. $m < -1$
- F. undefined
- G. there is no tangent line

32. The graph of the function f is shown below. Which statement best describes the value of $f'(3)$?



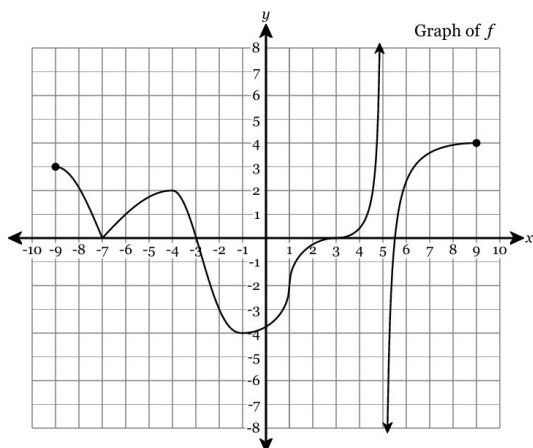
- A. $f'(3) = 0$
- B. $0 < f'(3) < 1$
- C. $f'(3) > 1$
- D. $-1 < f'(3) < 0$
- E. $f'(3) < -1$
- F. $f'(3)$ does not exist

33. The graph of the function f is shown below. Which statement best describes the value of $f'(-4)$?



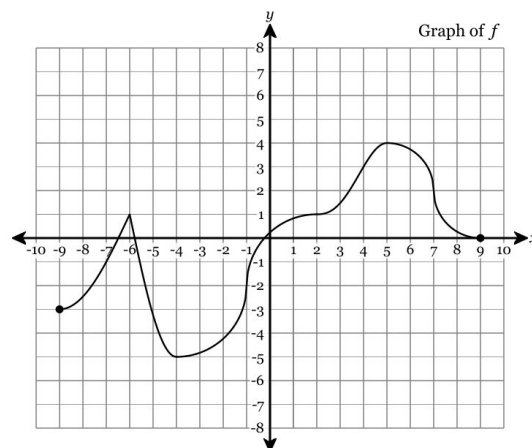
- A. $f'(-4) = 0$
- B. $0 < f'(-4) < 1$
- C. $f'(-4) > 1$
- D. $-1 < f'(-4) < 0$
- E. $f'(-4) < -1$
- F. $f'(-4)$ does not exist

34. The graph of the function f is shown below. If m is the slope of the line tangent to the graph of f at $x = 8$, which statement best describes the value of m ?



- A. $m = 0$
- B. $0 < m < 1$
- C. $m > 1$
- D. $-1 < m < 0$
- E. $m < -1$
- F. undefined
- G. there is no tangent line

35. The graph of the function f is shown below. If m is the slope of the line tangent to the graph of f at $x = -5$, which statement best describes the value of m ?



- A. $m = 0$
- B. $0 < m < 1$
- C. $m > 1$
- D. $-1 < m < 0$
- E. $m < -1$
- F. undefined
- G. there is no tangent line

36. For the following equation, find $f'(x)$.

$$f(x) = 2x^5$$

37. For the following equation, find $f'(x)$.

$$f(x) = -5e^4$$

38. For the following equation, find $f'(x)$.

$$f(x) = 3x^3$$

39. For the following equation, find $f'(x)$.

$$f(x) = 4$$

40. Given the function $y = -\frac{1}{2x^3}$, find $\frac{dy}{dx}$. Express your answer in simplest form without using negative exponents.

41. Given the function $f(x) = -\frac{1}{2\sqrt{x}}$, find $f'(x)$.

Express your answer in radical form without using negative exponents, simplifying all fractions.

42. Given the function $f(x) = -\frac{4\sqrt{x}}{3}$, find $f'(x)$.

Express your answer in radical form without using negative exponents, simplifying all fractions.

43. Given $f(x) = x^2 + x + 1$, find the equation of the tangent line of f at the point where $x = -3$.

44. Given $f(x) = 2x^3 + 3x^2$, find the slope of the tangent line of f at the point where $x = 2$.

45. Given the function $f(x) = \frac{3}{5}x^5 + \frac{1}{12}x - \frac{2}{3}x^4$, find $f''(x)$ in simplified form.

46. Given the function $f(x) = \frac{1}{6} - 2x - \frac{4}{3}x^{-1} + \frac{3}{4}x^4$, find $f'''(x)$ in simplified form.

47. Given the function $f(x) = x^3 - 5x^2 \sin x$, find $f'(x)$ in any form.

48. Given the function $f(x) = x^3 - 3x \cos x$, find $f'(x)$ in any form.

49. Given the function $y = (3x^3 - 2x^2) \sin x$, find $\frac{dy}{dx}$ in any form.

50. Given the function $f(x) = \frac{3-2x^2}{2x^2+3}$, find $f'(x)$ in *simplified* form.

51. Given the function $y = \frac{3-x^4}{2x^4+5}$, find $\frac{dy}{dx}$ in *simplified* form.

52. Given the function $y = -3 \cos [(2x^3 + 2)^3]$, find $\frac{dy}{dx}$.

53. Given the function $y = 2 \sin^4(2x - 3)$, find $\frac{dy}{dx}$.

54. Given the function $f(x) = 3 \sin^3(x^2)$, find $f'(x)$.

55. Given the function $y = 4\sqrt{\cos(4x^3)}$, find $\frac{dy}{dx}$.