Entering Calculus Summer Homework



Name

_____

Please read all instructions before beginning this packet.

This packet is designed to serve as a checkpoint for the material covered in your Delta Math online assignment. You must complete the Delta Math assignment first before starting this packet.

Show all work directly in this packet.
If you need additional space, use lined paper and clearly label each problem.
Submit the completed printed packet when you return to school in August.

To maintain your academic progress, the math department at CSN expects you to spend approximately one hour per week working on these problem sets. Most problems can be completed without a calculator.

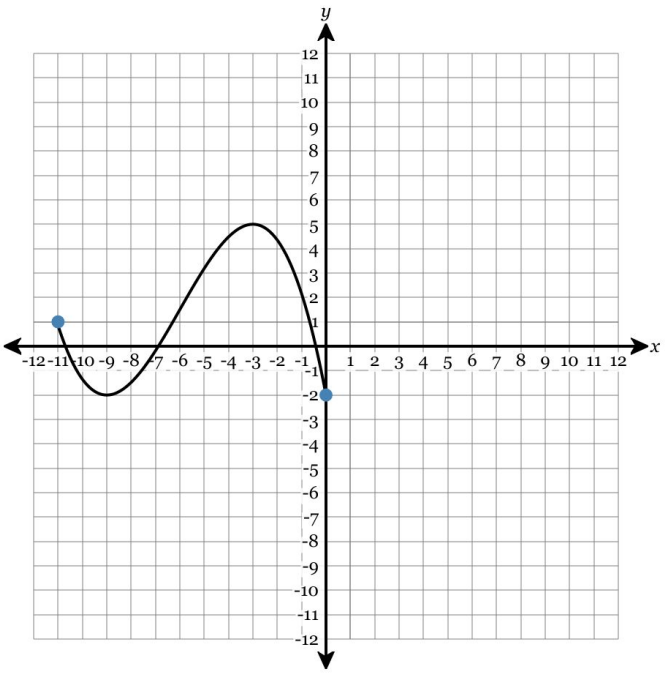
Your grade will be based on:

- Completion
- Accuracy
- A beginning-of-year assessment given during the first week of school

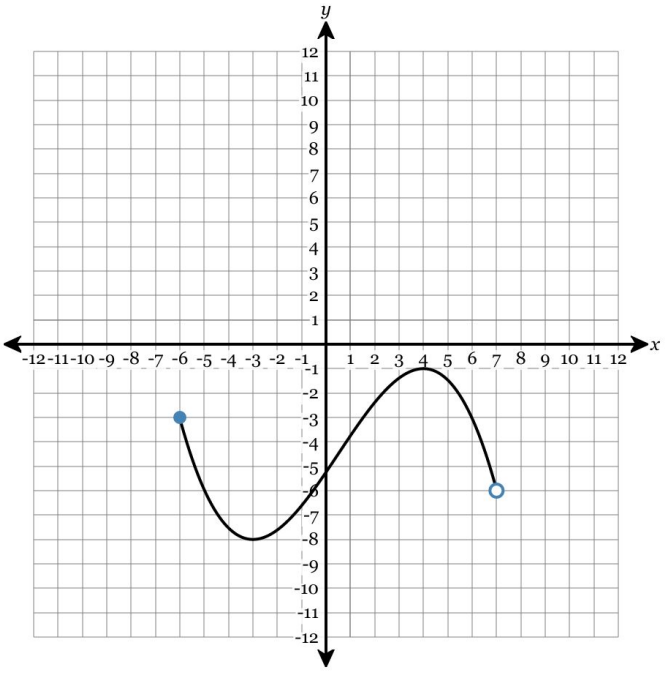
Please give your best effort. This work helps reflect your individual strengths and areas for growth, and it also allows the department to analyze overall student performance. Teachers will use this information to adjust instruction and better support your learning.

Please reach out to your teacher or the department chair with any questions or concerns.

1. Determine the domain of the following graph:



2. Determine the range of the following graph:



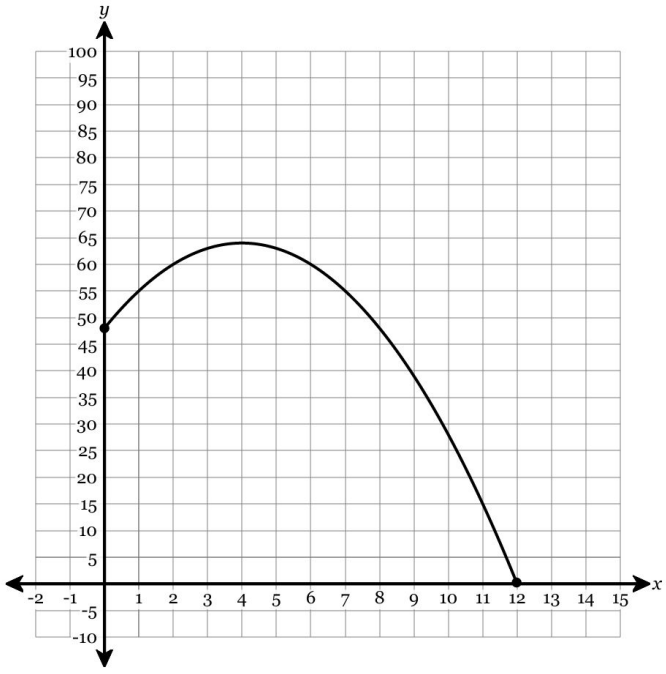
3. Find the domain of f(x).

$$f(x) = \frac{2x+5}{\sqrt{-x^2-4x+21}}$$

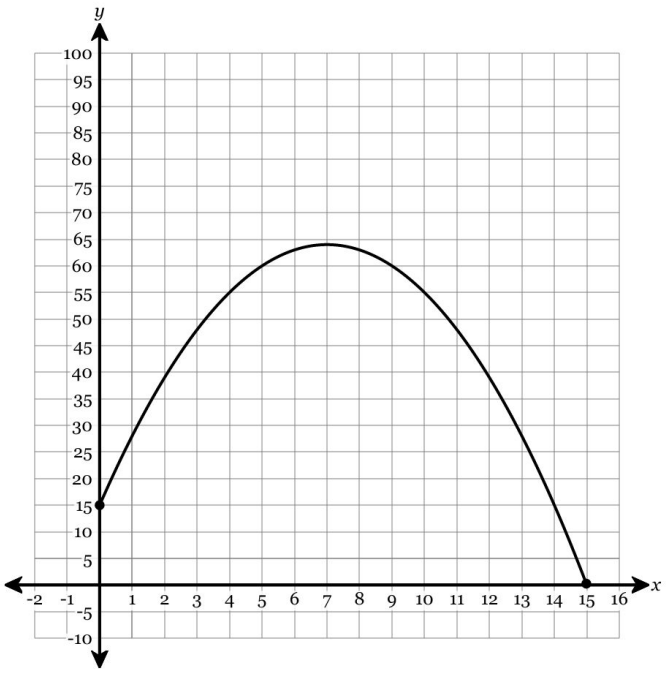
4. Find the domain of f(x).

$$f(x) = \sqrt{x^2-x-6}$$

5. Determine the domain on which the following function is *decreasing*.



6. Determine the domain on which the following function is *increasing*.



7. Given the function $f(x) = -\frac{4}{5}x^3 - \frac{3}{2}$, find the value of $f(1)$ in simplest form.

8. Given the function $f(x) = \frac{5}{8}x^3 + \frac{7}{5}x$, find the value of $f(-2)$ in simplest form.

9. Solve the following inequality *algebraically*.

$$x^2 + 5x - 36 \leq 0$$

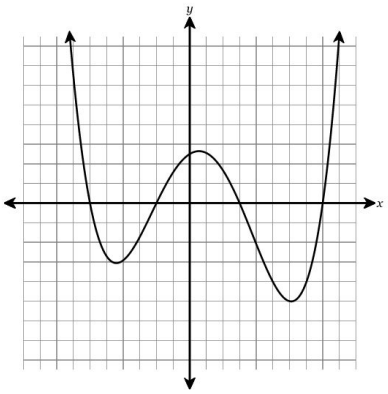
10. Solve the following inequality *algebraically*.

$$x^2 + 2x - 80 \geq 0$$

11. Given the function $g(x) = x^2 + 9x + 17$, determine the average rate of change of the function over the interval $-5 \leq x \leq -1$.

12. Given the function $h(x) = x^2 + 3x - 1$, determine the average rate of change of the function over the interval $-6 \leq x \leq 1$.

13. The graph of $y = f(x)$ is graphed below. What is the end behavior of $f(x)$?



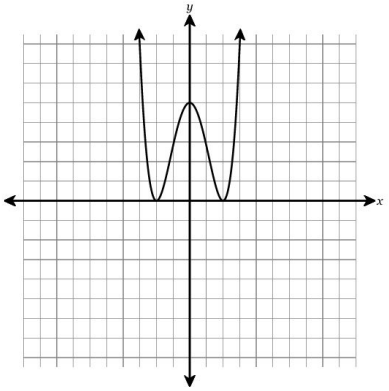
A. as $x \to -\infty, y \to \infty$ and
as $x \to \infty, y \to \infty$

B. as $x \to -\infty, y \to -\infty$ and
as $x \to \infty, y \to -\infty$

C. as $x \to -\infty, y \to \infty$ and
as $x \to \infty, y \to -\infty$

D. as $x \to -\infty, y \to -\infty$ and
as $x \to \infty, y \to \infty$

14. The graph of $y = f(x)$ is graphed below. What is the end behavior of $f(x)$?



A. as $x \to -\infty, y \to -\infty$ and
as $x \to \infty, y \to \infty$

B. as $x \to -\infty, y \to \infty$ and
as $x \to \infty, y \to -\infty$

C. as $x \to -\infty, y \to \infty$ and
as $x \to \infty, y \to \infty$

D. as $x \to -\infty, y \to -\infty$ and
as $x \to \infty, y \to -\infty$

15. The function $f(x)$ is defined below. What is the end behavior of $f(x)$?

$$f(x) = 8x^5 + 112x^4 - 1288x + 960 - 176x^2 + 384x^3$$

A. as $x \to \infty, y \to \infty$ and
as $x \to -\infty, y \to \infty$

B. as $x \to \infty, y \to \infty$ and
as $x \to -\infty, y \to -\infty$

C. as $x \to \infty, y \to -\infty$ and
as $x \to -\infty, y \to \infty$

D. as $x \to \infty, y \to -\infty$ and
as $x \to -\infty, y \to -\infty$

16. The function $f(x)$ is defined below. What is the end behavior of $f(x)$?

$f(x) = 348x^4 + 1536x - 24x^5 + 2298x^2 + 384 - 6x^6 + 1512x^3$

A. as $x \to \infty, y \to \infty$ and
as $x \to -\infty, y \to -\infty$

B. as $x \to \infty, y \to -\infty$ and
as $x \to -\infty, y \to \infty$

C. as $x \to \infty, y \to -\infty$ and
as $x \to -\infty, y \to -\infty$

D. as $x \to \infty, y \to \infty$ and
as $x \to -\infty, y \to \infty$

17. Factor completely:

$$(x+8)^6 - (x+8)^7$$

18. Factor completely:

$$5(9x-8)^6 + (9x-8)^7$$

19. Find the 4th term in the expansion of $(a+b)^4$ in simplest form.

20. Find the 4th term in the expansion of $(a+b)^{10}$ in simplest form.

21. Use the long division method to find the result when $6x^3 + 13x^2 + 15x + 6$ is divided by $3x + 2$.

22. Use the long division method to find the result when $16x^3 + 24x^2 + 13x + 10$ is divided by $4x + 5$.

23. Use synthetic division to find the result when $3x^4 + 3x^3 - 24x^2 + 2x + 20$ is divided by $x - 2$.

24. Use synthetic division to find the result when $3x^3 + 13x^2 + 6x - 18$ is divided by $x + 3$.

25. Simplify the expression completely if possible.

$$\frac{x^2 - 4}{x^2 - x - 2}$$

26. Simplify the expression completely if possible.

$$\frac{x^2 - 2x - 35}{2x^2 + 2x}$$

27. Fully Simplify: $\dfrac{x - \frac{25}{x}}{\frac{x-10}{25} + \frac{1}{x}}$

28. Fully Simplify: $\dfrac{\frac{x}{4} - \frac{1}{2}}{\frac{2}{x^2} - \frac{1}{2}}$

29. Fully Simplify: $\dfrac{1-\frac{9}{x^2}}{\frac{x}{9}+\frac{1}{3}}$

30. Combine the following fractions and express in simplified form.

$$\frac{4}{5x}+\frac{7}{5x}$$

31. Combine the following fractions and express in simplified form.

$$\frac{2x}{9}-\frac{1}{2}$$

32. Simplify the fraction completely. If the fraction does not simplify, write the fraction in its current form.

$$\frac{50x^2}{70x^2}$$

33. Simplify the fraction completely. If the fraction does not simplify, write the fraction in its current form.

$$\frac{41x^3}{7}$$

34. Find all vertical asymptotes of the following function.

$$f(x)=\frac{9x^2-64}{6x^2-46x+80}$$

35. Find all vertical asymptotes of the following function.

$$f(x)=\frac{3x^2-2x-1}{6x+2}$$

36. Find all horizontal asymptotes of the following function.

$$f(x) = \frac{2x(5x+2)}{3(5x+2)}$$

37. Find all horizontal asymptotes of the following function.

$$f(x) = \frac{2x^2+26x+60}{x^2+14x+40}$$

38. Find all x-intercepts of the following function. Write your answer or answers as coordinate points.

$$f(x) = \frac{x^2+3x-4}{3x-30}$$

39. Find all x-intercepts of the following function. Write your answer or answers as coordinate points.

$$f(x) = \frac{2x+12}{x^2+11x+30}$$

40. Find all y-intercepts of the following function. Express your answer as a coordinate point in simplest form.

$$f(x) = \frac{x^2-9}{2x^2-5x-42}$$

41. Find all y-intercepts of the following function. Express your answer as a coordinate point in simplest form.

$$f(x) = \frac{x^2-9}{3x+9}$$

42. Find the common difference of the arithmetic sequence $15, 6, -3, ...$

43. Find the common ratio of the geometric sequence
$-6, 12, -24, ...$

44. Find the 75th term of the arithmetic sequence
$-1, 15, 31, ...$

45. Find the 85th term of the arithmetic sequence
$-25, -37, -49, ...$

46. Find the 11th term of the geometric sequence
$1, 4, 16, ...$

47. Find the 9th term of the geometric sequence
$6, -24, 96, ...$

48. The first three terms of a sequence are given. Write your answer as a decimal or whole number. Round to the nearest *thousandth* (if necessary).

$$50, 30, 18, ...$$

Find the 9th term.

49. The first three terms of a sequence are given. Write your answer as a decimal or whole number. Round to the nearest *thousandth* (if necessary).

$$8, 15, 22, ...$$

Find the 45th term.

50. In a geometric sequence, the first term, a_1, is equal to 3, and the third term, a_3, is equal to 12. Which number could represent the common ratio of the geometric sequence?

A. $r = -1$ B. $r = 0$

C. $r = 1$ D. $r = 2$

51. In an arithmetic sequence, the first term, a_1, is equal to 1, and the fourth term, a_4, is equal to 10. Which number represents the common difference of the arithmetic sequence?

A. $d = 2$ B. $d = 3$ C. $d = 4$ D. $d = 5$

52. Given the definitions of $f(x)$ and $g(x)$ below, find the value of $f(g(1))$.

$$f(x) = -5x + 11$$
$$g(x) = 2x^2 - 7x + 1$$

53. Given the definitions of $f(x)$ and $g(x)$ below, find the value of $(f \circ g)(6)$.

$$f(x) = x^2 + 4x - 6$$
$$g(x) = -2x + 11$$

54. Express your answer as a polynomial in standard form.

$$f(x) = 2x^2 + 2x - 6$$
$$g(x) = 2x + 5$$
$$\text{Find: } (f \circ g)(x)$$

55. Express your answer as a polynomial in standard form.

$$f(x) = x^2 - 6x + 12$$
$$g(x) = -4x - 15$$
$$\text{Find: } (g \circ f)(x)$$

56. What is the value of $\log_2 128$?

57. What is the value of $\log_3 3$?

58. Condense the logarithm:

$$6 \log c + 8 \log d$$

59. Condense the logarithm:

$$\log d - r \log c$$

60. Write the expression below as a single logarithm in simplest form.

$$\log_b 4 + 2 \log_b 3$$

61. Write the expression below as a single logarithm in simplest form.

$$2\log_b 9 - \log_b 3$$

62. Expand the logarithm fully using the properties of logs. Express the final answer in terms of $\log x$.

$$\log 4x^5$$

63. Expand the logarithm fully using the properties of logs. Express the final answer in terms of $\log x$, and $\log y$.

$$\log x^4 y$$

64. Expand the logarithm fully using the properties of logs. Express the final answer in terms of $\log x$, $\log y$, and $\log z$.

$$\log \frac{\sqrt{y^5} z^4}{x^5}$$

65. Expand the logarithm fully using the properties of logs. Express the final answer in terms of $\log x$, $\log y$, and $\log z$.

$$\log \frac{y}{z^5 \sqrt[3]{x^4}}$$

66. Find the exact value of $\tan 30^\circ$ in simplest form.

67. Find the exact value of $\cos 90^\circ$ in simplest form.

68. Find the exact value of $\sin 330^\circ$ in simplest form.

69. Find the exact value of $\cos 60^\circ$ in simplest form.

70. Find the exact value of $\sin 270^\circ$ in simplest form.

71. Find the exact value of $\sin 45^\circ$ in simplest form.

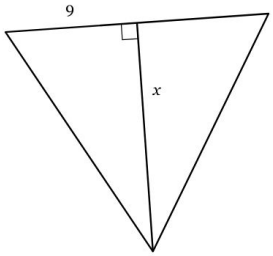
72. Find the exact value of $\sin 30^\circ$ in simplest form.

73. Find the exact value of $\tan 180^\circ$ in simplest form.

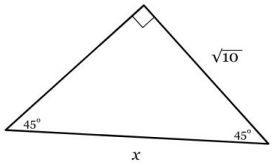
74. Find the exact value of $\cos 210^\circ$ in simplest form.

75. Find the exact value of $\tan 315^\circ$ in simplest form.

76. The triangle below is equilateral. Find the length of side x in simplest radical form with a rational denominator.



77. Find the length of side x in simplest radical form with a rational denominator.



78. Find the reference angle in radians for a rotation of $\frac{2\pi}{13}$.

79. Find the reference angle in radians for a rotation of $\frac{5\pi}{3}$.

80. Find the exact value of $\tan \frac{\pi}{4}$, expressing your answer with a rational denominator.

81. Find the exact value of $\tan \frac{\pi}{3}$, expressing your answer with a rational denominator.

82. Find the exact value of $\cos \frac{\pi}{3}$, expressing your answer with a rational denominator.

83. Find the exact value of $\sin \frac{\pi}{6}$, expressing your answer with a rational denominator.

84. Find the exact value of $\cos \frac{\pi}{4}$, expressing your answer with a rational denominator.

85. Find the exact value of $\sec \frac{4\pi}{3}$ in simplest form.

86. Find the exact value of $\cot \frac{\pi}{6}$ in simplest form.

87. Find the exact value of $\cos \frac{\pi}{6}$ in simplest form.

88. Find the exact value of $\tan \frac{2\pi}{3}$ in simplest form.

89. Find the exact value of $\tan \frac{7\pi}{6}$ in simplest form.

90. Convert the polar coordinates $\left(6\sqrt{3},\ \frac{5\pi}{6}\right)$ into rectangular form. Express your answer in simplest radical form.

91. Convert the polar coordinates $\left(6\sqrt{3},\ \frac{\pi}{3}\right)$ into rectangular form. Express your answer in simplest radical form.

92. Convert the rectangular coordinates $(-6,\ 0)$ into polar form. Express the angle using radians in terms of π over the interval $0 \leq \theta < 2\pi$, with a positive value of r.

93. Convert the rectangular coordinates $\left(-2\sqrt{3},\ -2\right)$ into polar form. Express the angle using radians in terms of π over the interval $0 \leq \theta < 2\pi$, with a positive value of r.

94. Express in simplest form with a rational denominator.

$$\frac{3}{\sqrt{63}}$$

95. Express in simplest form with a rational denominator.

$$\frac{7}{\sqrt{2}}$$

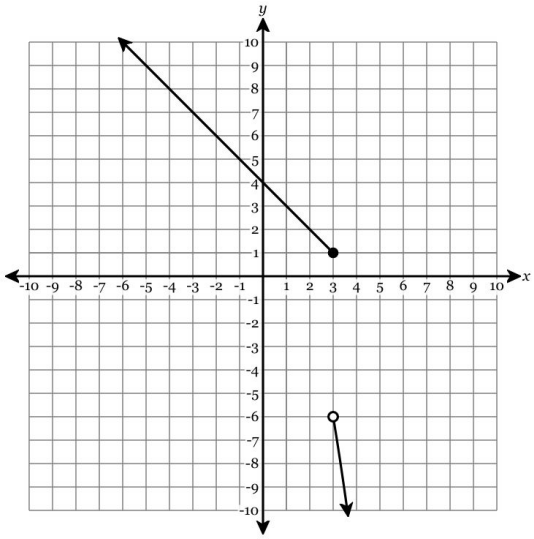
96. Express as a fraction in simplest form with a rational denominator:

$$\frac{5}{10+\sqrt{15}}$$

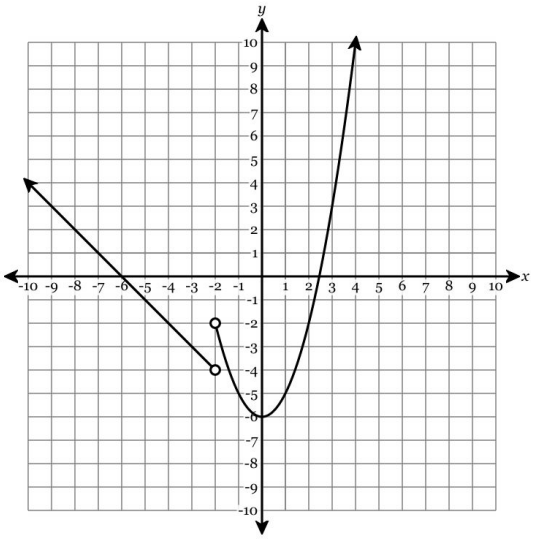
97. Express as a fraction in simplest form with a rational denominator:

$$\frac{10}{5+\sqrt{14}}$$

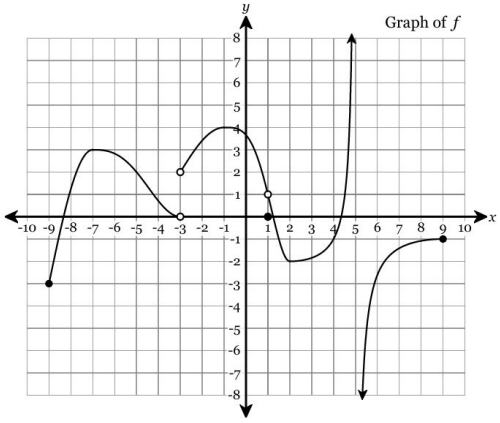
98. For the function $f(x)$ shown below, determine $f(3)$.



99. For the function $f(x)$ shown below, determine $\lim_{x \to -2^-} f(x)$.



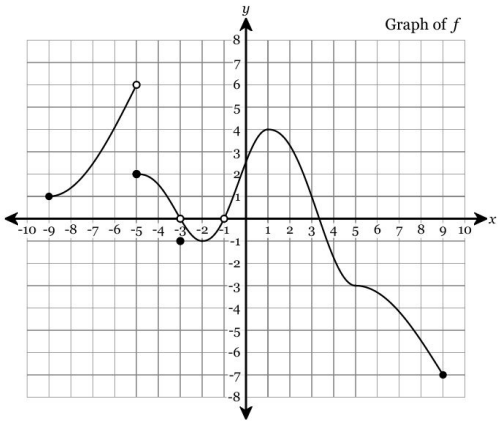
100. Answer all of the questions below about the function $f(x)$ graphed below when $x = -5$. Write dne and undefined to reference values that do not exist or are undefined.



$\lim_{x \to -5^-} f(x) =$ ____ $\lim_{x \to -5^+} f(x) =$ ____

$\lim_{x \to -5} f(x) =$ ____ $f(-5) =$ ____

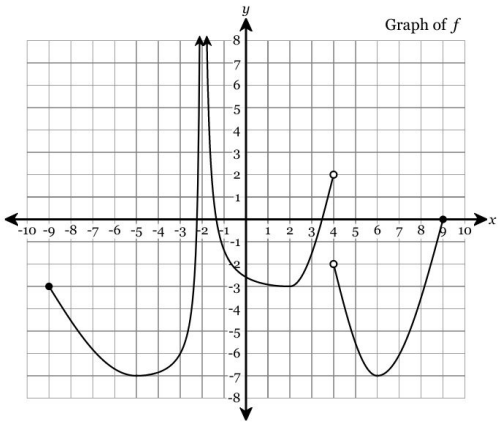
101. Answer all of the questions below about the function $f(x)$ graphed below when $x = -1$. Write dne and undefined to reference values that do not exist or are undefined.



$\lim_{x \to -1^-} f(x) =$ ____ $\lim_{x \to -1^+} f(x) =$ ____

$\lim_{x \to -1} f(x) =$ ____ $f(-1) =$ ____

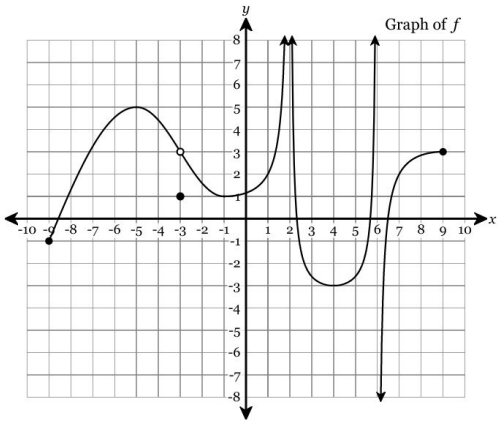
102. Answer all of the questions below about the function $f(x)$ graphed below when $x = 4$. Write dne and undefined to reference values that do not exist or are undefined.



$\lim_{x \to 4^-} f(x) =$ ____ $\lim_{x \to 4^+} f(x) =$ ____

$\lim_{x \to 4} f(x) =$ ____ $f(4) =$ ____

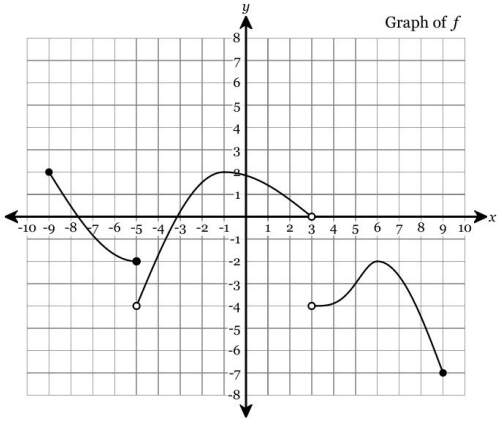
103. Answer all of the questions below about the function $f(x)$ graphed below when $x = 6$. Write dne and undefined to reference values that do not exist or are undefined.



$\lim_{x \to 6^-} f(x) =$ ____ $\lim_{x \to 6^+} f(x) =$ ____

$\lim_{x \to 6} f(x) =$ ____ $f(6) =$ ____

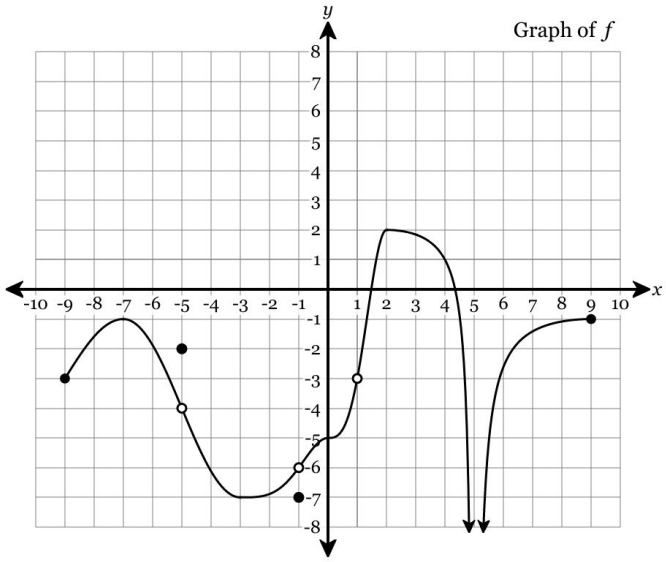
104. Answer all of the questions below about the function $f(x)$ graphed below when $x = 6$. Write dne and undefined to reference values that do not exist or are undefined.



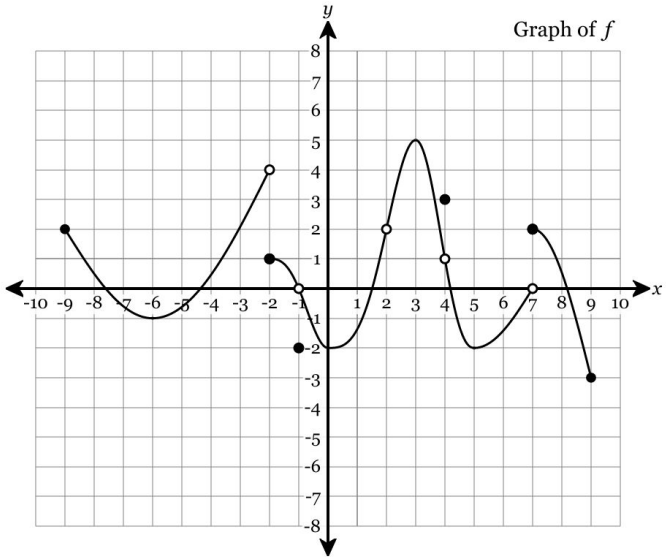
$\lim_{x \to 6^-} f(x) =$ ____ $\lim_{x \to 6^+} f(x) =$ ____

$\lim_{x \to 6} f(x) =$ ____ $f(6) =$ ____

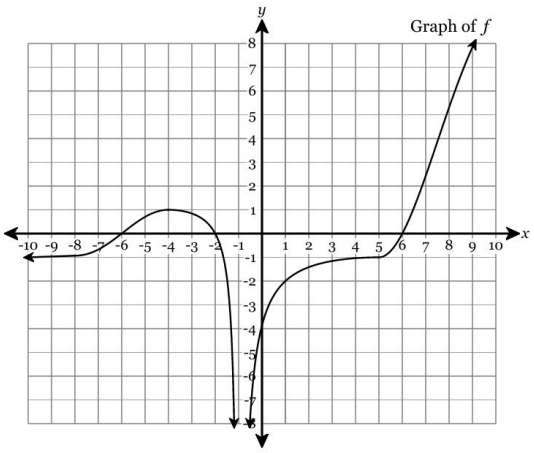
105. Use the graph of the function $f(x)$ shown below in order to determine $\lim_{x \to 5^+} f(x)$. If the limit does not exist, write DNE.



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



107. The function f is shown below. Determine the equations of all vertical and horizontal asymptotes of f and complete the sentences below. You may not need to use all four statements.



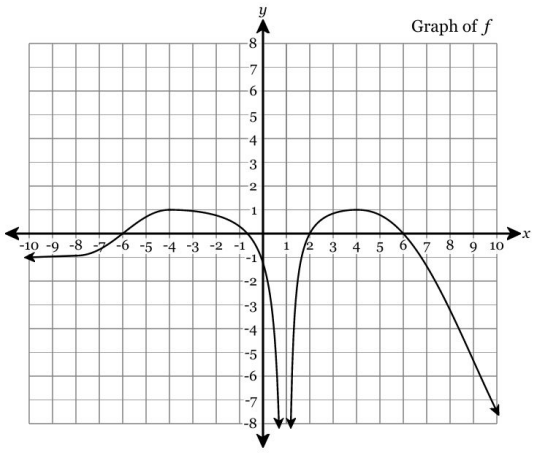
There is a (horizontal / vertical) asymptote at (x / y) = $\underset{a}{____}$ because the limit as $x \to$ ($\underset{a}{____}$ / ∞ / $-\infty$) of $f(x)$ equals ($\underset{a}{____}$ / ∞ / $-\infty$).

There is a (horizontal / vertical) asymptote at (x / y) = $\underset{b}{____}$ because the limit as $x \to$ ($\underset{b}{____}$ / ∞ / $-\infty$) of $f(x)$ equals ($\underset{b}{____}$ / ∞ / $-\infty$).

There is a (horizontal / vertical) asymptote at (x / y) = $\underset{c}{____}$ because the limit as $x \to$ ($\underset{c}{____}$ / ∞ / $-\infty$) of $f(x)$ equals ($\underset{c}{____}$ / ∞ / $-\infty$).

There is a (horizontal / vertical) asymptote at (x / y) = $\underset{d}{____}$ because the limit as $x \to$ ($\underset{d}{____}$ / ∞ / $-\infty$) of $f(x)$ equals ($\underset{d}{____}$ / ∞ / $-\infty$).

108. The function f is shown below. Determine the equations of all vertical and horizontal asymptotes of f and complete the sentences below. You may not need to use all four statements.



There is a (horizontal / vertical) asymptote at (x / y) = $\underset{a}{____}$ because the limit as $x \to$ ($\underset{a}{____}$ / ∞ / $-\infty$) of $f(x)$ equals ($\underset{a}{____}$ / ∞ / $-\infty$).

There is a (horizontal / vertical) asymptote at (x / y) = $\underset{b}{____}$ because the limit as $x \to$ ($\underset{b}{____}$ / ∞ / $-\infty$) of $f(x)$ equals ($\underset{b}{____}$ / ∞ / $-\infty$).

There is a (horizontal / vertical) asymptote at (x / y) = $\underset{c}{____}$ because the limit as $x \to$ ($\underset{c}{____}$ / ∞ / $-\infty$) of $f(x)$ equals ($\underset{c}{____}$ / ∞ / $-\infty$).

There is a (horizontal / vertical) asymptote at (x / y) = $\underset{d}{____}$ because the limit as $x \to$ ($\underset{d}{____}$ / ∞ / $-\infty$) of $f(x)$ equals ($\underset{d}{____}$ / ∞ / $-\infty$).

109. Determine whether the function $f(x)$ is continuous at $x = -6$.

$$f(x) = \begin{cases} 14 - x^2, & x \geq -6 \\ -10 + 2x, & x < -6 \end{cases}$$

A. $f(x)$ is continuous at $x = -6$

B. $f(x)$ is discontinuous at $x = -6$

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

$$f(x) = \begin{cases} 13 - 5x^2, & x \geq 2 \\ -14 + 2x, & x < 2 \end{cases}$$

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

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

111. For the function $f(x)$ shown below, determine $\lim\limits_{x \to 2} f(x)$. If the limit does not exist, write DNE.

$$f(x) = \begin{cases} -2x^2 + 2 & \text{for} \quad x > 2 \\ 2 - 4x & \text{for} \quad x \leq 2 \end{cases}$$

112. For the function $f(x)$ shown below, determine $\lim\limits_{x \to -4^+} f(x)$. If the limit does not exist, write DNE.

$$f(x) = \begin{cases} -7 - x & \text{for} \quad x > -4 \\ -10 + x^2 & \text{for} \quad x \leq -4 \end{cases}$$

113. Determine the limit shown below in simplest form.

$$\lim_{x \to -7} \frac{x^2 + x - 42}{-5x - 35}$$

114. Determine the limit shown below in simplest form.

$$\lim_{x \to -7} \frac{x^2 - 11x + 28}{x^2 + 10x + 24}$$

115. Evaluate the limit: $\lim\limits_{x \to -13^+} \dfrac{\sqrt{x + 13}}{5x + 65}$

116. Evaluate the limit: $\lim_{x \to 0} \dfrac{49 - x}{7 - \sqrt{x}}$

117. Evaluate the limit: $\lim_{x \to 6} \dfrac{\frac{5}{2} - \frac{2x-7}{x-4}}{x - 6}$

118. Evaluate the limit: $\lim_{x \to 2} \dfrac{\frac{2x-8}{x-1} - \frac{4}{7}}{4x - 3}$