

The exact instructions which will appear on the show-your-work portion of the exam are reproduced here.

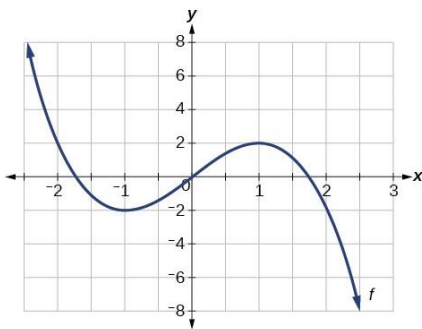
SHOW YOUR WORK

For this portion of the exam you will be graded on the work that you show to solve the problem. If you do not show any work, you will not be given any credit. If you use your calculator for any part of a problem, you must write down your steps/graphs and how you arrived at your answer based on this information.

Here are several problems that may be similar to what will appear on the handwritten, show-your-work portion of the exam. You should attempt to write out complete solutions to these problems on separate paper.

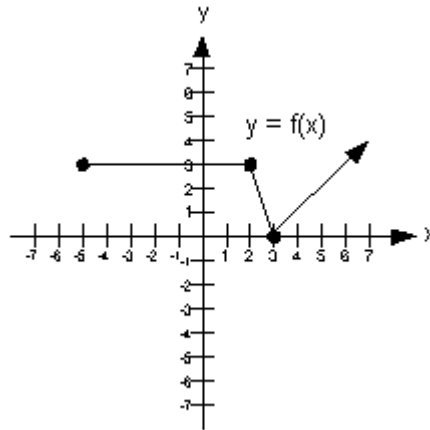
Determine the intervals on which the functions shown are: increasing, decreasing, or constant and evaluate at the indicated values.

1.



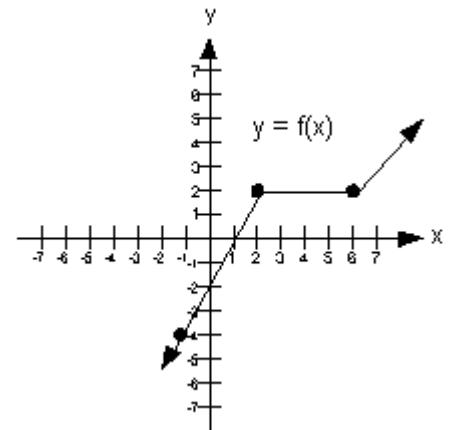
$$f(-2), f(-1), f(0), f(1), f(2)$$

2.



$$f(-3), f(0), f(1), f(2), f(3)$$

3.



$$f(-1), f(0), f(2), f(4), f(6)$$

Determine the domain of each piecewise function, graph the function, and find the value of $f(-3), f(-1), f(0), f(1), f(2)$.

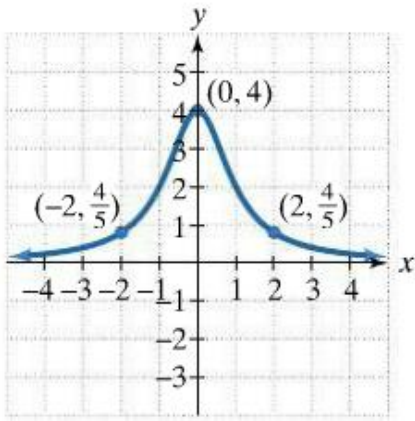
$$4. f(x) = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$$

$$5. f(x) = \begin{cases} \frac{1}{2}x^2, & x < 1 \\ 2x - 1, & x \geq 1 \end{cases}$$

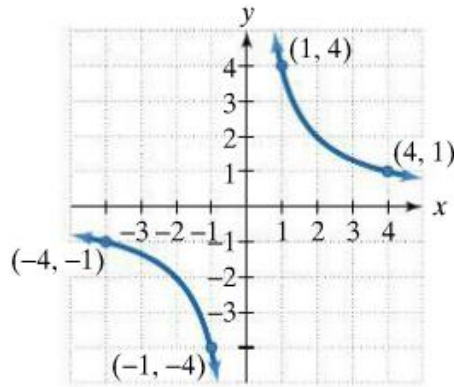
$$6. f(x) = \begin{cases} 0, & x < -3 \\ -x, & -3 \leq x < 0 \\ x^2 - 1, & x \geq 0 \end{cases}$$

Determine the domain and range, and whether each graph is odd, even, or neither.

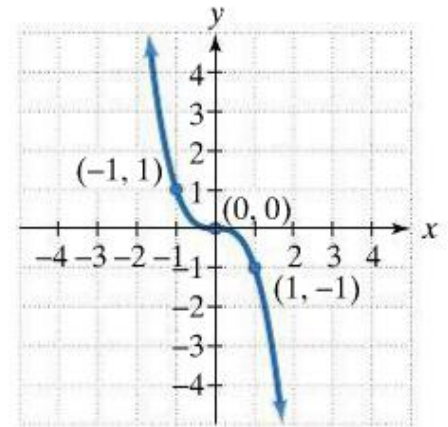
7.



8.



9.



Draw $f(x)$, the parent graph, and $g(x)$ on the same set of axes.

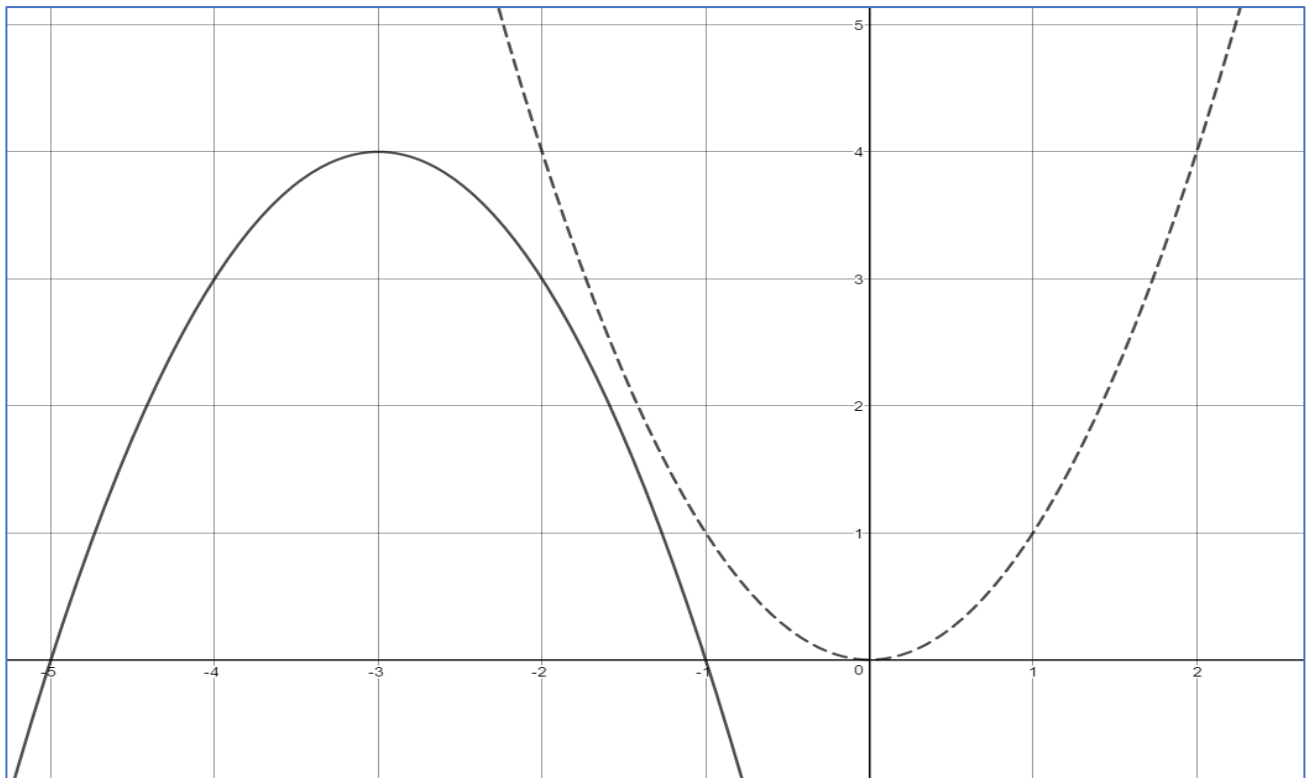
10. $f(x) = x^2$
 $g(x) = -2(x+1)^2 - 3$

11. $f(x) = |x|$
 $g(x) = -|x+4| + 1$

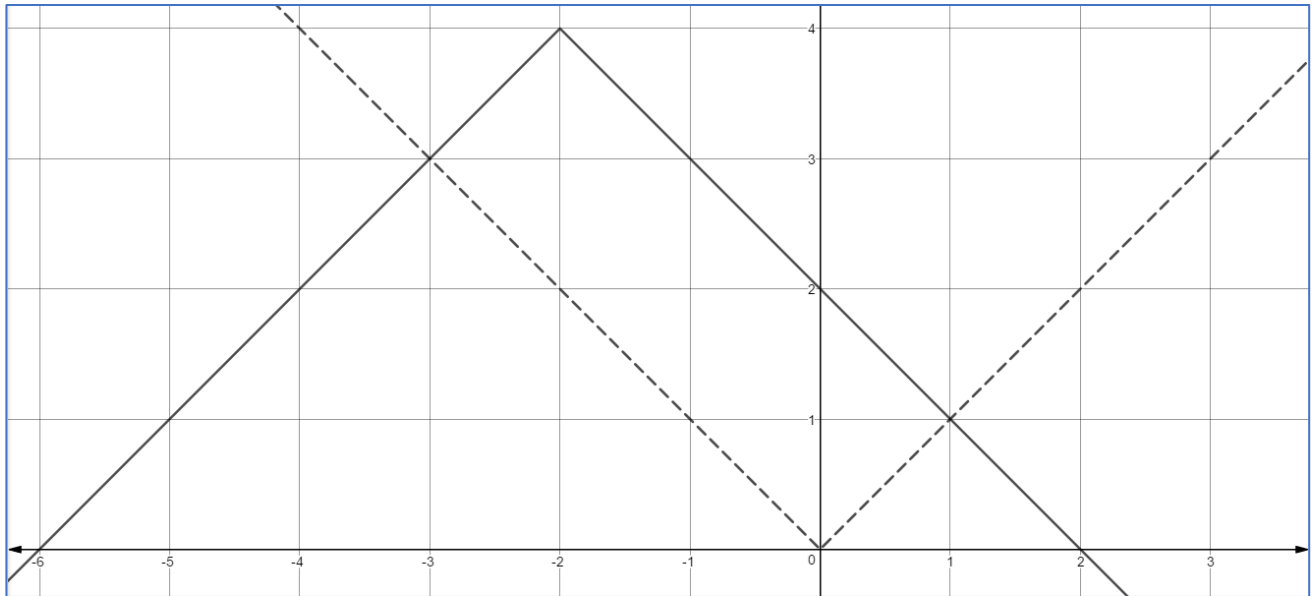
12. $f(x) = \sqrt{x}$
 $g(x) = -\sqrt{x+2} - 1$

The dashed graph is the parent graph and the solid graph is $f(x)$. Write the equation of $f(x)$ based on the parent graph and its transformations.

13.



14.



For each $f(x)$ and $g(x)$ determine: $f + g$, $f - g$, fg , and $\frac{f}{g}$ and the domain for each function.

15. $f(x) = 3x - 4$, $g(x) = x + 2$

16. $f(x) = 6x^2 - x - 1$, $g(x) = x - 1$

17. $f(x) = \frac{3x+1}{x^2-25}$, $g(x) = \frac{2x-4}{x^2-25}$

18. $f(x) = \sqrt{x+5}$, $g(x) = \sqrt{x-3}$

Using synthetic division, determine all real and complex roots.

19. $f(x) = x^3 - 2x^2 - 5x + 6$

20. $f(x) = x^4 - 81$

21. $f(x) = 3x^3 - 5x^2 - 5x + 7$

List all possible rational roots of $f(x)$ using the Rational Zero Theorem, and then find all zeros (both real and complex) of the polynomial function.

22. $f(x) = x^2 + 3x - 10$

23. $f(x) = 4x^2 - 8x + 6$

24. $f(x) = 2x^5 + 7x^4 - 18x^2 - 8x + 8$

25. $f(x) = x^4 - 16$

Identify where $f(x)$ is undefined, and state the domain in interval notation.

26. $f(x) = \frac{1}{\sqrt{x}}$

27. $f(x) = \frac{1}{x^2-9}$

28. $f(x) = \frac{1}{x^2-2x+1}$

29. $f(x) = \sqrt{5-x}$

Perform the indicated operation and simplify the following expressions.

$$30. \frac{x+3}{5} \div \frac{x^2-9}{25}$$

$$31. \frac{2x^2-2x-4}{x^2+2x-8} \div \frac{4x^2-100}{x^2-x-20}$$

$$32. \frac{64x}{x-7} \times \frac{x^3-2x^2-49x+98}{8x^2}$$

$$33. \frac{7x}{x-4} + \frac{2x}{x^2-x-12}$$

$$34. \frac{x-2}{x+1} - \frac{3-12x}{2x^2-x-3}$$

$$35. \frac{5x-1}{x^2-3x+2} - \frac{3}{2x-4}$$

Find the Least Common Multiple for each questions.

$$36. 4, 10, 24$$

$$37. 9, 18, 36$$

$$38. 4x^2y, 12xy^3$$

$$39. 4(x+7), 6(x+7)^3$$

$$40. x^2-9, x^2-6x+9, x^2+7x+12$$

$$41. 5x^2+15x, x^2+6x+9$$

Determine the vertical and horizontal asymptote(s) and the values of x corresponding to holes, if any, for each rational function.

$$42. h(x) = \frac{x}{x^2+4x}$$

$$43. g(x) = \frac{x}{x+5}$$

$$44. f(x) = \frac{x^3}{x^2-1}$$

For each set of functions, find $(f \circ g)(x)$, $(g \circ f)(x)$, $(f \circ g)(2)$, $(g \circ f)(2)$.

$$45. f(x) = x^2+1, g(x) = 3x-2$$

$$46. f(x) = \sqrt{x}, g(x) = x+3$$

$$47. f(x) = \frac{1}{x+1}, g(x) = \frac{3}{x}$$

Solve and check.

$$48. \frac{x+2}{4} - \frac{x-1}{3} = 2$$

$$49. \frac{1}{x} = \frac{1}{5} + \frac{3}{2x}$$

$$50. \frac{3x}{5} - x = \frac{x}{10} - \frac{5}{2}$$

$$51. \frac{6}{x+3} + 2 = \frac{-2x}{x+3}$$

$$52. \frac{x}{x-2} = \frac{2}{x-2} - \frac{2}{3}$$

$$53. \frac{4}{x-2} + \frac{3}{x+5} = \frac{7}{x^2+3x-10}$$

$$54. \frac{4x}{x+3} - \frac{12}{x-3} = \frac{4x^2+36}{x^2-9}$$

$$55. \frac{3}{x+6} + \frac{1}{x-2} = \frac{4}{x^2+4x-12}$$