

College Algebra Math 1050

Sample Midterm Exam - Version 1

Name: _____

School: _____ Instructor: _____

Scientific (not graphing) calculators are allowed. Time limit is 75 min. The point value of each problem is written next to the problem. **You must show your work to receive any credit, except on problems 1–21.** Work neatly.

Fill in the blank or circle the correct answer.

1. (4 points) Write the difference quotient $DQ = \frac{f(x+h) - f(x)}{h}$ for the function $f(x) = \sqrt{x}$. Do NOT simplify.

2. (2 points) The solution of the inequality $|x| \leq 3$ in interval notation is _____

3. (3 points) The rational expression $\frac{x+3}{x^2-5x+6}$ has critical numbers at $x = -3$, $x = 2$, and $x = 3$. Find the solution to the inequality $\frac{x+3}{x^2-5x+6} > 0$. Write the solution in interval form.

4. (4 points) A firefighter holds a hose 3 ft off the ground and directs a stream of water toward a burning building. The height of the water can be approximated by $h(x) = -0.026x^2 + 0.576x + 3$, where $h(x)$ is the height of the water in meters at a point x meters horizontally from the firefighter in the direction of the building. What is the horizontal distance from the firefighter at which the maximum height of the water occurs?

5. (4 points) Consider the inequality $|x + 1| - 3 < 2$. Which correctly describes a first step in solving the inequality?

- (a) Nona's first step to solve the inequality is: $x + 1 - 3 < 2$
- (b) Lulu's first step to solve the inequality is: $-2 < x + 1 - 3 < 2$
- (c) Mari's first step to solve the inequality is: $|x + 1| < 5$
- (d) None is a correct step.

Circle all that apply.

6. (3 points) Consider the inequality $\frac{2x - 1}{x + 1} < 3$. Which correctly describes a first step in solving the inequality?

- (a) Guga's first step to solve the inequality is: $\frac{2x - 1}{x + 1} - 3 < 0$.
- (b) Nino's first step to solve the inequality is: $\frac{x - 1}{1} < 3$.
- (c) Rezo's first step to solve the inequality is: $2x - 1 < 3(x + 1)$.
- (d) None is a correct step.

Circle all that apply.

7. (3 points) Given a zero (root) $x = -1$ of the polynomial $f(x) = x^3 + 3x^2 + 4x + 2$, find all the remaining zeros (roots) of the polynomial $f(x)$. Simplify completely.

8. (4 points) To simplify the difference quotient $DQ = \frac{\frac{1}{x+h} - \frac{1}{x}}{h}$ of the function $g(x) = \frac{1}{x}$, which correctly describes a first step?

- (a) David's first step is: $\frac{\frac{1}{x} + \frac{1}{h} - \frac{1}{x}}{h}$
- (b) Giorgi's first step is: $\frac{\frac{1}{x} + h - \frac{1}{x}}{h}$
- (c) Alex's first step is: $\frac{(\frac{1}{x+h} - \frac{1}{x})(x+h)x}{h(x+h)x}$
- (d) None is a correct step.

Circle all that apply.

9. (3 points) A polynomial equation with real coefficients has a zero $x = 4i + 1$.

Another zero is $x =$ _____.

10. (4 points) Given the function $f(x) = \frac{2x - 1}{x + 1}$ with the domain $D(f) = \{x \mid x \neq -1\}$ and the function $g(x) = \frac{x + 1}{x - 2}$ with the domain $D(g) = \{x \mid x \neq 2\}$, find the domain of the function $(f \cdot g)(x)$.

_____.

For problems from 11 to 13, consider the function $f(x) = \frac{3x - 1}{x^2 + 3x + 2}$.

11. (1 point) The domain of the function $f(x)$ is _____.

12. (1 point) The x -intercept(s) of $f(x)$ are _____. **Write your answer(s) as ordered pair(s).**

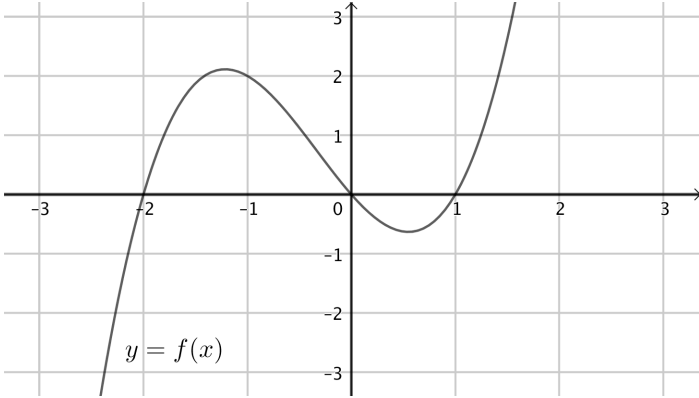
13. (1 point) The y -intercept(s) of $f(x)$ are _____. **Write your answer(s) as ordered pair(s).**

For problems from 14 to 15, consider the function $g(x) = \frac{x^2 + 3x - 2}{x^2 + 2}$. **Write your answer(s) in equation form.**

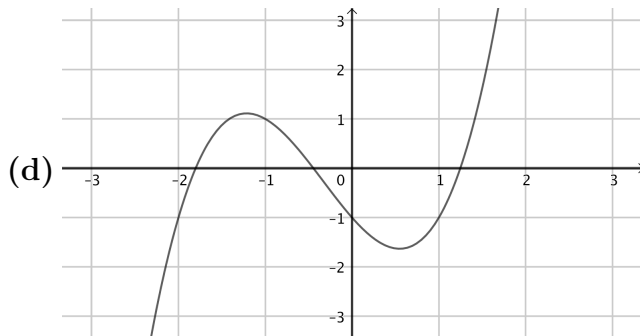
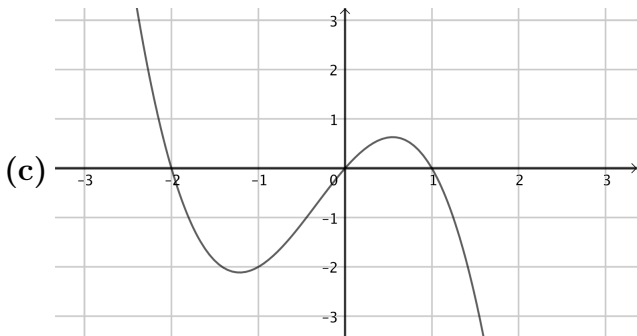
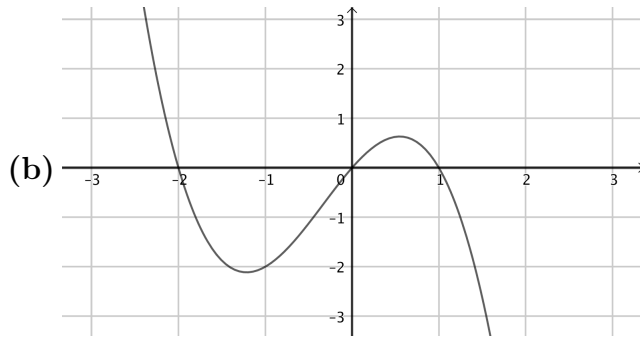
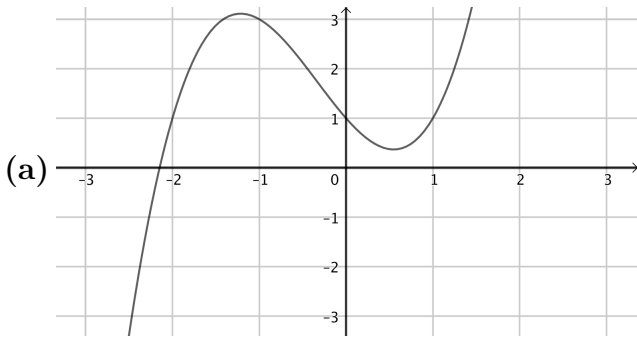
14. (2 points) The vertical asymptote(s), if any, of the function $g(x)$ is (are) _____.

15. (2 points) The non-vertical asymptote(s), if any, of the function $g(x)$ is (are) _____.

16. (2 points) Below is a picture of the graph of a function $y = f(x)$.

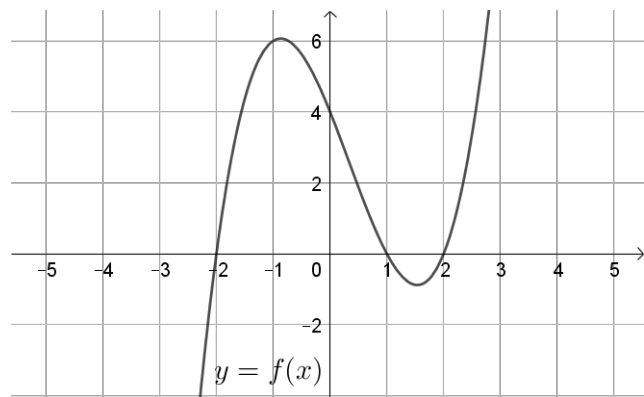


Which of the following is the graph of $g(x) = f(x) - 1$. Mark the correct answer(s).



17. (4 points) Given the graph of the function $y = f(x)$, let $g(x) = f(x - 2) - 1$.

What is $g(0)$? _____



18. (3 points) Given a subset of all possible rational zeros (roots) $-3, -\frac{1}{2}, \frac{3}{2}, 6$ of the polynomial $h(x) = 2x^3 - x^2 - 13x - 6$, find a rational zero of the polynomial $h(x)$. _____

19. (3 points) List all solutions to the equation $|x + 4| = 3$. _____

20. (3 points) Give the list of possible rational zeros (roots) of the polynomial equation

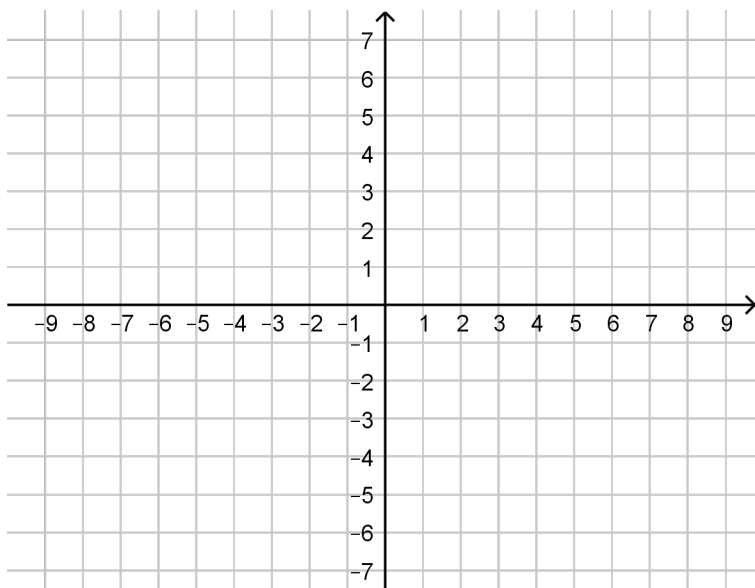
$g(x) = 3x^4 + 7x^2 - 2x + 35 = 0$. _____

21. (3 points) Given the table shown, evaluate $(f - g)(-1)$.

x	-3	-2	-1	0	1	2	3
$f(x)$	-7	-5	-3	-1	3	5	7
$g(x)$	8	3	0	-1	0	3	8

22. (8 points) The height of a jumper can be modeled by $h(x) = -0.046x^2 + 0.64x$, where h is the jumper's height in meters and x is the horizontal distance from the point of launch. What is the maximum height of the jumper? Round to 2 decimal places. **Justify your answer.**

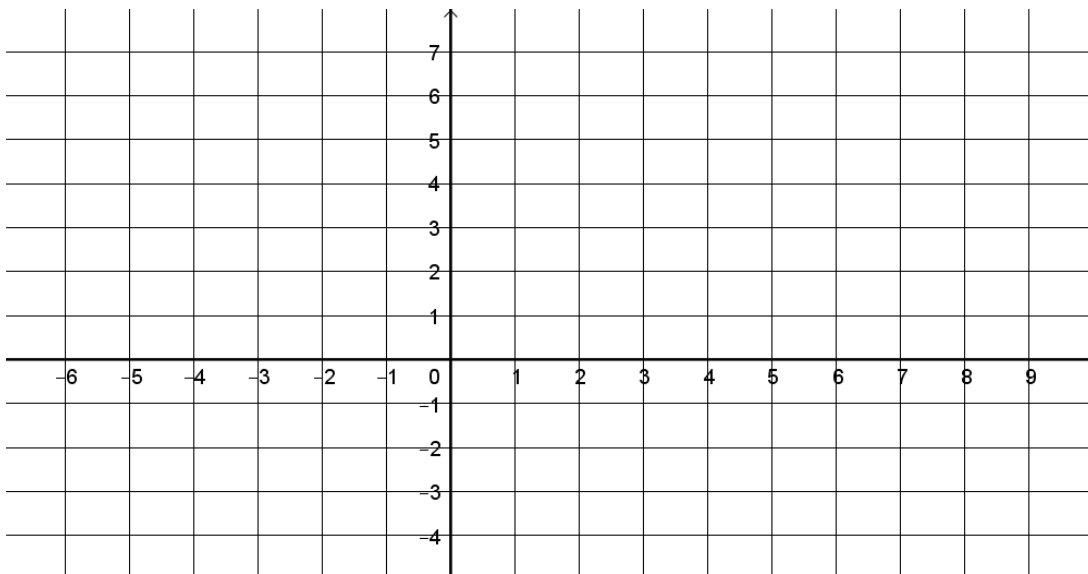
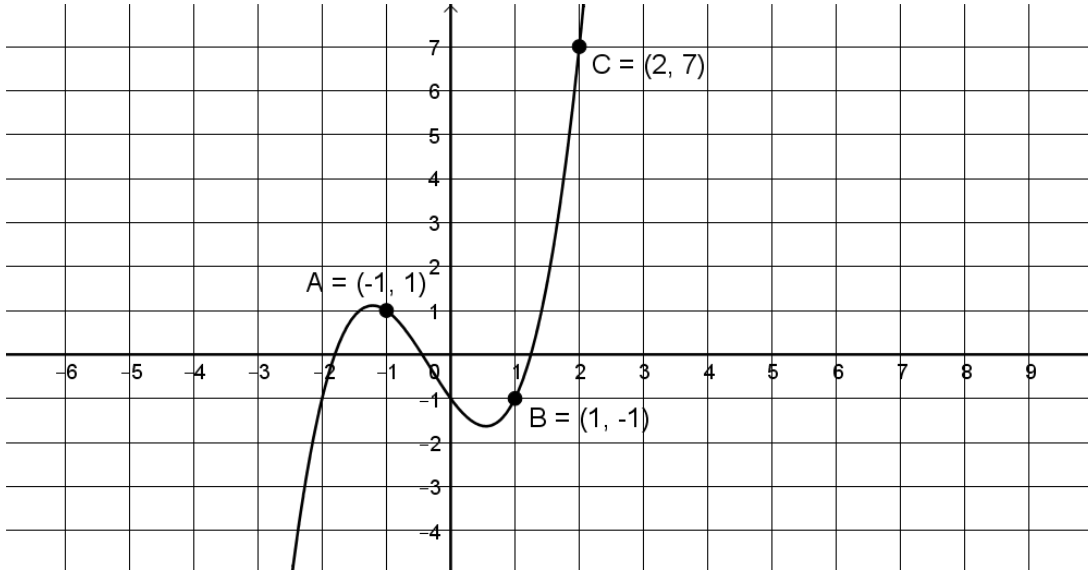
23. (9 points) Graph the rational function $f(x) = \frac{x^2 - x - 6}{x - 1}$. Your graph should clearly show and label all x and y intercepts and asymptotes.



24. (8 points) Solve the inequality $\frac{1}{x - 1} \geq \frac{1}{2x + 4}$. State the solution in interval notation.

24. _____

25. (8 points) The graph of a function $y = f(x)$ is given below. Sketch the graph of the function $g(x) = -f(x - 1) + 1$ on the blank axis below. Be sure your graph shows the images of the points $A = (-1, 1)$, $B = (1, -1)$, and $C = (2, 7)$.



26. (8 points) Solve the inequality $|1 - 2x| + 3 > 5$. State the solution in interval notation.

26. _____