College Algebra Math 1050

Sample Midterm Exam-3

Name: _____

School: _____ Instructor: _____ Period: _____

Scientific (not graphing) calculators are allowed. Time limit is 75 minutes. 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. (3 points) List **all** of the possible rational zeros (roots) of the polynomial

$f(x) = 2x^5 - 4x^4 + x^2 - 5x - 3$. _____

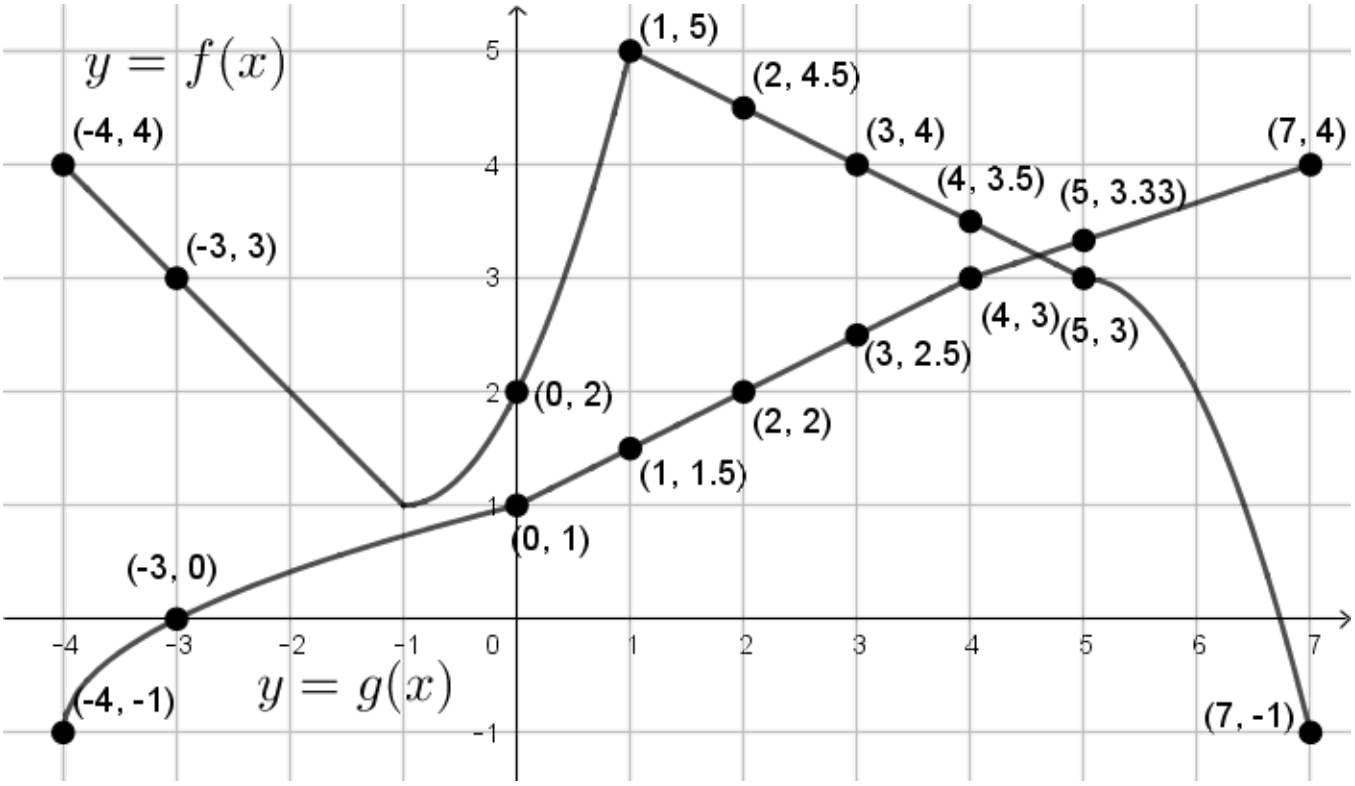
2. (3 points) The following: $-5, -\frac{1}{2}, \frac{5}{4}$ are a subset of *possible* rational zeros (roots) of $g(x) = 4x^4 - 16x^3 - 85x^2 + 202x + 120$. Which of $-5, -\frac{1}{2}, \frac{5}{4}$ is/are rational zero(s) of $g(x)$?

_____

3. (3 points) Given that $x = 2$ is a root (zero) of $h(x) = x^3 - 2x^2 + 4x - 8$, find the remaining roots (zeros) of the polynomial $h(x)$. _____

4. (3 points) If $(x+3)$ is a factor of a polynomial $P(x)$, then $x =$ _____ is a zero of $P(x)$.

5. (3 points) Given the graph shown, evaluate $(f+g)(1)$. _____



6. (3 points) List all solutions to the equation $|x| = 2$. _____

7. (3 points) The solution of the inequality $|x| \leq 4$ in **interval notation** is _____

8. (4 points) Given the function $f(x) = \sqrt{4-x}$ with the domain $D(f) = \{x \mid x \leq 4\}$ and the function $g(x) = \sqrt{x+2}$ with the domain $D(g) = \{x \mid x \geq -2\}$, find the domain of the function

$(f+g)(x)$. Write your answer in **interval notation**. _____

9. (4 points) Write the difference quotient $DQ = \dfrac{f(x+h) - f(x)}{h}$ for the function

$f(x) = \dfrac{1}{2x+3}$. **Do not simplify.** _____

10. (4 points) The difference quotient, DQ, for a function $g(x)$ is:

$DQ = \dfrac{[(x+h)^2 + 2(x+h) - 3] - [x^2 + 2x - 3]}{h}$. Which choice below describes a valid first step to simplify the quotient?

(a) Tornike's first step is: $\dfrac{(x^2 + h^2 + 2x + 2h - 3) - (x^2 + 2x - 3)}{h}$.

(b) Rati's first step is: $\dfrac{(x^2 + 2xh + h^2 + 2x + 2h - 3) - (x^2 + 2x - 3)}{h}$.

(c) Gocha's first step is: $\dfrac{(x+h)^2 + 2(x+h) - 3 - x^2 + 2x - 3}{h}$.

(d) None is a valid first step to solve the quotient.

Circle all that apply.

For problems from 11-13, consider the function $f(x) = \dfrac{x^2 + x - 6}{3x - 1}$.

11. (2 points) The domain of the function $f(x)$ is _____.

Write your answer in any form.

For problems from 11-13, consider the function $f(x) = \dfrac{x^2 + x - 6}{3x - 1}$.

12. (2 points) The x-intercept(s) of $f(x)$ is (are) _____. **Write your answer(s) as ordered pair(s).**

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

For problems from 14 to 15, consider the function $g(x) = \dfrac{x - 2}{x^2 - x - 12}$. **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. (3 points) Consider the piece-wise function $f(x) = \begin{cases} (x+1)^2 & \text{if} \quad x < 1 \\ 2x - 1 & \text{if} \quad x \geq 1 \end{cases}$. Evaluate the following.

(a) $f(1) =$ _____

(b) $f(-1) =$ _____

(c) $f(2) =$ _____

17. (3 points) Consider the piece-wise function $g(x) = \begin{cases} 3x - 2 & \text{if} \quad x < 0 \\ x^2 + 2x - 8 & \text{if} \quad x \geq 0 \end{cases}$.

The x-intercept(s) of $g(x)$ is (are) _____. **Write your answer(s) as ordered pair(s).**

18. (4 points) A projectile is fired from a cliff 150 feet above the water at an inclination of 45 degrees to the horizontal with a muzzle velocity of 40 feet per second. The height, h, of the projectile above the water, in feet, is modeled by:

$$h(x) = -\frac{32}{40^2}x^2 + x + 150,$$

where x is the horizontal distance of the projectile from the face of the cliff. At what horizontal distance from the face of the cliff is the height of the projectile a maximum? **Justify your answer.**

_____

19. (3 points) Consider the inequality $2x - 3 \geq \dfrac{5}{x}$. Which describes a valid first step to solve the inequality?

(a) Baba's first step to solve the inequality is: $\dfrac{1}{2x-3} \leq \dfrac{x}{5}$

(b) Zorba's first step to solve the inequality is: $2x^2 - 3x \geq 5$.

(c) Levan's first step to solve the inequality is: $2x - 3 - \dfrac{5}{x} \geq 0$.

(d) None is a valid first step to solve the inequality.

Circle all that apply.

20. (3 points) The rational expression $\dfrac{3x+2}{x^2+2x-8}$ has critical numbers at $x = -4$, $x = -\frac{2}{3}$, and $x = 2$. Find the solution to the inequality $\dfrac{3x+2}{x^2+2x-8} \geq 0$. **Write the solution in interval form.** _____

21. (4 points) Consider the equation $|x + 2| - 5 = 1$. Which describes a valid first step to solve the equation?

(a) Nana's first step to solve the equation is: $x + 2 - 5 = 1$.

(b) Leli's first step to solve the equation is: $|x + 2| = 6$.

(c) Tina's first step to solve the equation is: $|x| - 3 = 1$.

(d) None is a valid first step to solve the equation.

Circle all that apply.

22. (8 points) Solve the inequality. **State the solution in interval notation.**

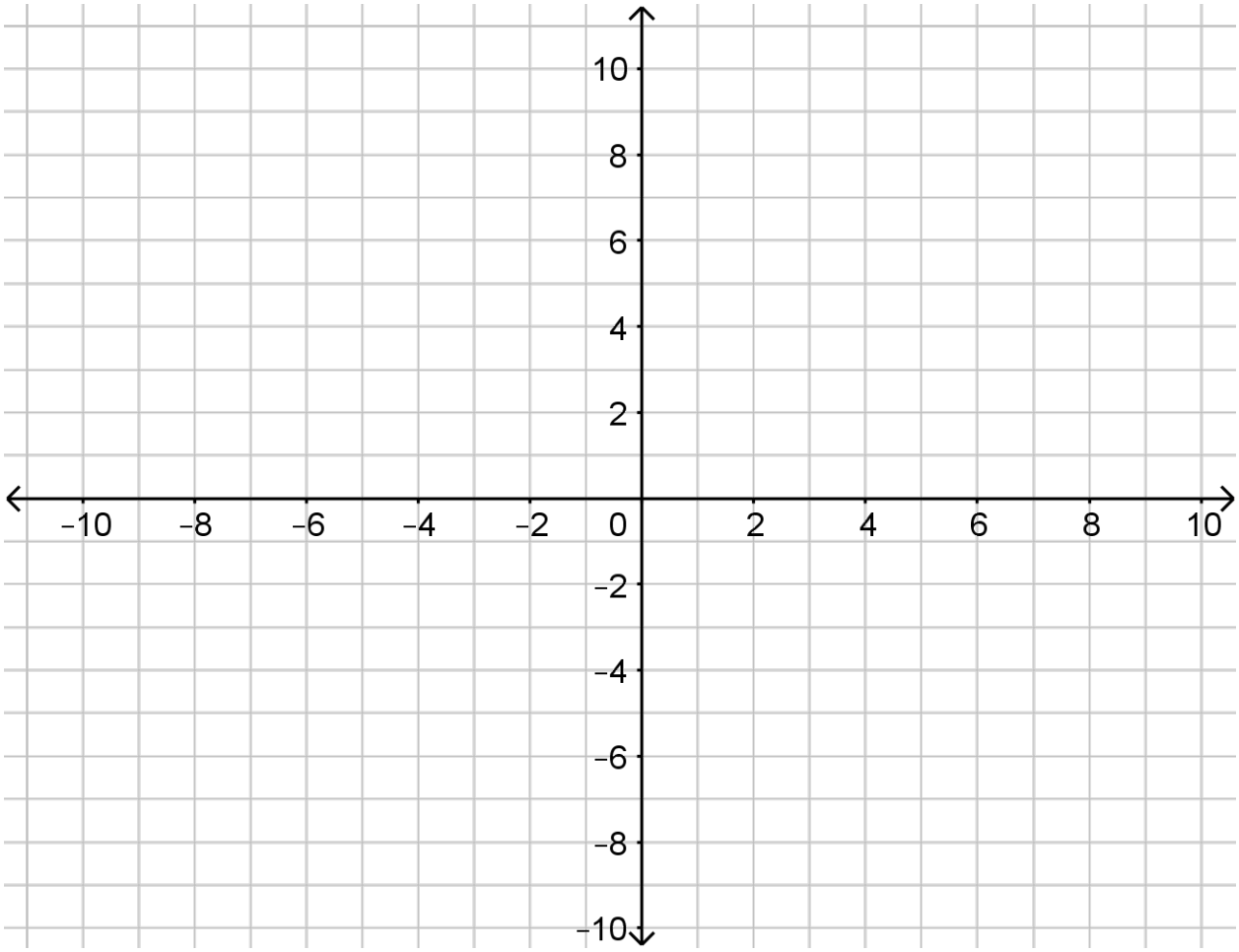
$$\frac{5}{2x-1} > \frac{1}{x-1}$$

22. Answer _____

23. (5 points) Solve the equation. $|4-x|-4=1$.

23. Answer _____

24. (9 points) Graph the rational function $f(x) = x + \dfrac{2}{x-1}$. Your graph should clearly show and label all x and y-intercepts and asymptotes.



25. (8 points) An accepted relationship between stopping distance, d, in feet, and the speed of a car, v, in miles per hour, is $d = 1.3v + 0.09v^2$ on dry, level concrete.

(a) How many feet will it take a car traveling 55 miles per hour to stop on dry, level concrete? **Justify your answer.**

25. (a) Answer _____

(b) If an accident occurs 230 feet ahead of you, what is the maximum speed you should be traveling to avoid being involved? **Round your answer to two decimal places**

25. (b) Answer _____

26. (8 points) Consider the piece-wise function $f(x) = \begin{cases} 3x - 2 & \text{if} \quad x < 2 \\ (x-3)^2 & \text{if} \quad x \geq 2 \end{cases}$.

Graph the function. Be sure to mark and label three points for each piece of the function.