MTH 161, Quiz #5, Fall 2024 Name KEY

Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Find $f \circ g$ and $g \circ g$ for $f(x) = 2x - 7, g(x) = x^2 + 1$, and state the domain of each.

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

$g \circ g = (x^2+1)^2 + 1 = x^4 + 2x^2 + 1 + 1 = x^4 + 2x^2 + 2$

domain for both is $(-\infty, \infty)$

2. Find the inverse function $f^{-1}(x)$ for the function $f(x) = \frac{3x-2}{x+1}$. What is the domain and range of the function and its inverse?

original
D: $(-\infty, -1) \cup (-1, \infty)$
R: $(-\infty, 3) \cup (3, \infty)$

$x = \frac{3y-2}{y+1} \rightarrow x(y+1) = 3y - 2$

$xy + x = 3y - 2$

$xy - 3y = -2 - x$

$y(x-3) = -2 - x$

$y = \frac{-(2+x)}{x-3}$

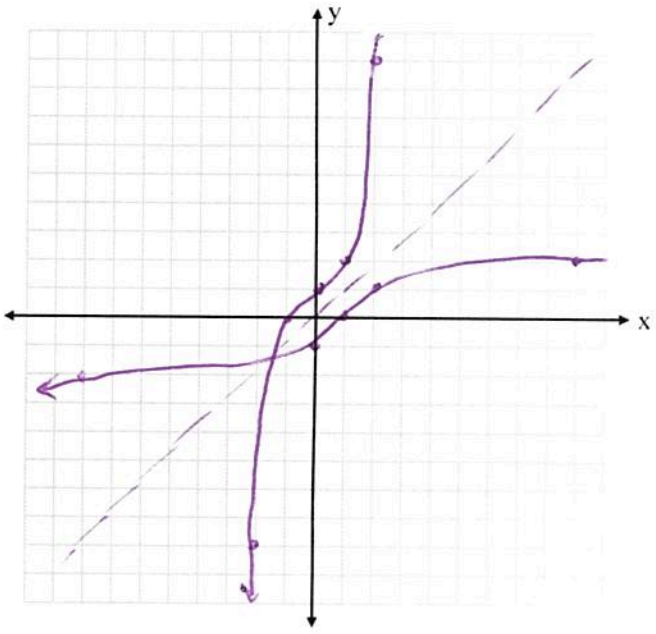
inverse:
D: $(-\infty, 3) \cup (3, \infty)$
R: $(-\infty, -1) \cup (-1, \infty)$

3. Find the inverse function of $f(x) = x^3 + 1$. Sketch the graph of f and f^{-1} on the same graph. Plot the line of symmetry.

$y - 1 = x^3$

$\sqrt[3]{y-1} = x$

$f^{-1}(x) = \sqrt[3]{x-1}$



4. Solve the equations.

a. $2x + 1 = \sqrt{3 - 3x}$

$(2x+1)^2 = 3-3x$

$4x^2+4x+1 = 3-3x$

$4x^2+7x-2=0$

$(4x-1)(x+2)=0$

$x = \frac{1}{4}, -2$

$2(\frac{1}{4})+1 = \frac{3}{2}$ $\sqrt{3-3(\frac{1}{4})} = \sqrt{\frac{9}{4}} = \frac{3}{2}$ ✓

$2(-2)+1 = -4+1 = -3$

$\sqrt{3-3(-2)} = \sqrt{3+6} = \sqrt{9} = +3$ ✗

Signs don't make

b. $5 - (4 - 2x)^{2/3} = 1$

$-(4-2x)^{2/3} = -4$

$(4-2x)^{2/3} = 4$

$(4-2x)^2 = 64$

$4-2x = \pm 8$?

$\{-2, 6\}$

$4-2x = 8$

$-2x = 4$

$x = -2$

$5-(4-2(-2))^{2/3} =$

$5-(4+4)^{2/3} =$

$5-8^{2/3} = 5-4 = 1$ ✓

$4-2x = -8$

$-2x = -12$

$x = 6$

$5-(4-2(6))^{2/3} =$

$5-(-8)^{2/3} =$

$5-4 = 1$ ✓

5. Find the degree of the polynomial $p(x) = -x^2(3 - 5x)(x^2 + x + 4)$. Also find the leading term, the leading coefficient, the constant term and the end behavior of the polynomial.

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

fifth, positive leading coeff.

as $x \to -\infty$, $y \to -\infty$

as $x \to \infty$, $y \to \infty$

6. For the polynomial in #5, create a sign chart of the real zeros and create a rough sketch of the graph.

$3-5x=0$

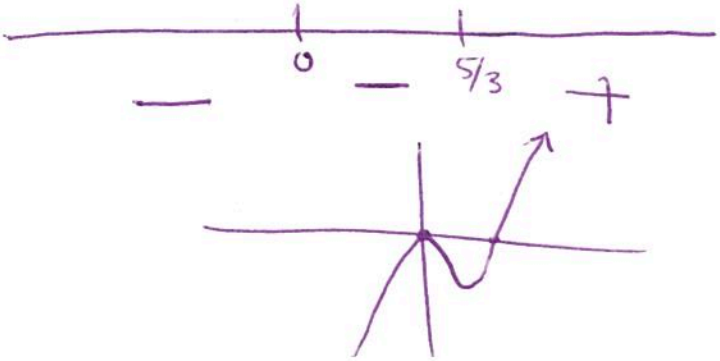
$3=5x$

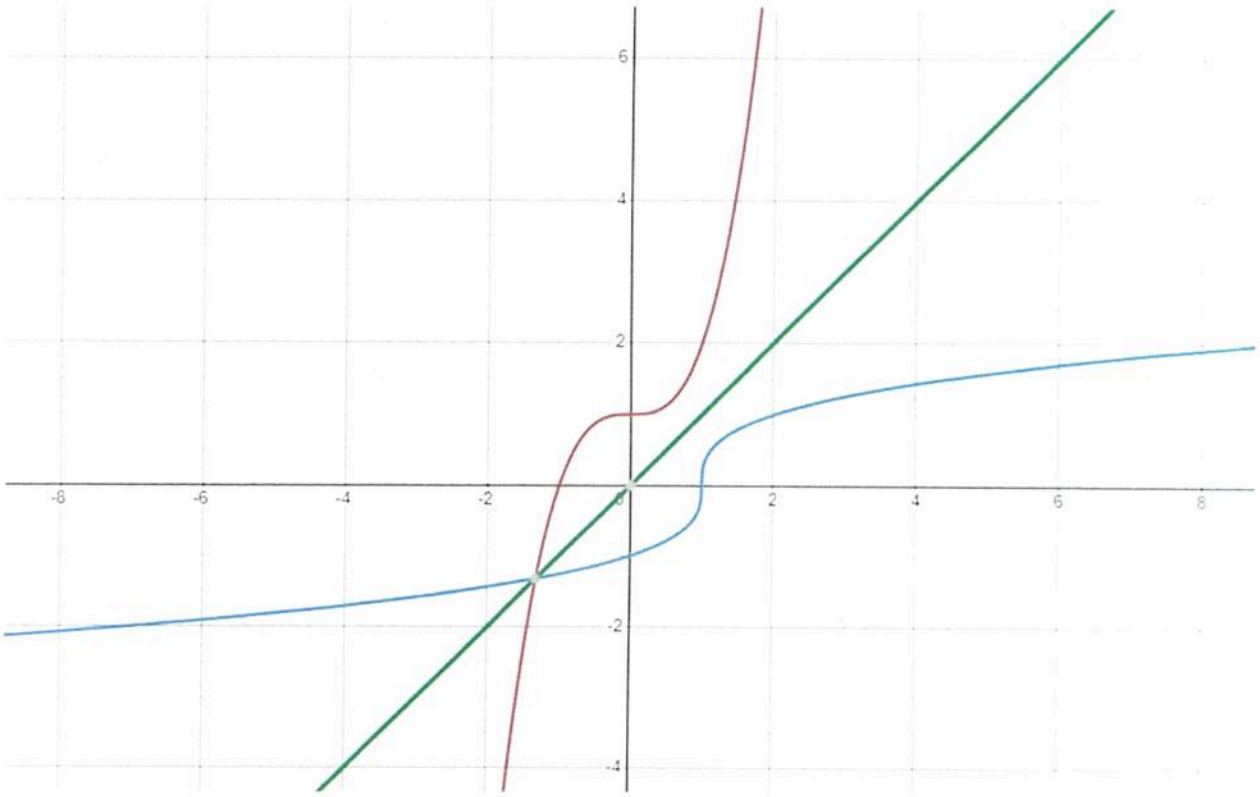
$x=\frac{5}{3}$

$x^2+x+4=0$

$x = \frac{-1 \pm \sqrt{1-4(1)(4)}}{2}$

Complex




6
4
2
-2
-4
-8
-6
-4
-2
2
4
6
8