

Quarter 2 Summative Review
Secondary III Honors

State how many complex zeros the function has and identify as real and non-real. (graph)

1. $f(x) = x^2 - 2x + 7$
2 complex: 2 nonreal

2. $f(x) = x^3 - x + 3$
3 complex: 1 real, 2 nonreal

3. $f(x) = x^4 - 2x^2 + 3x - 4$
4 complex: 2 real, 2 nonreal

4. $f(x) = x^5 - 2x^2 - 3x + 6$
5 complex: 1 real, 4 nonreal

Write a polynomial in factored form with minimum degree given the following zeros.

5. $x = 1, x = 3i$

$f(x) = (x-1)(x-3i)(x+3i)$

6. $x = 3, x = -2$ (mult of 2), $x = 4i$

$f(x) = (x-3)(x+2)^2(x-4i)(x+4i)$

Use the given zero to find all the zeros of the function.

7. $6i, f(x) = x^4 - 8x^3 + 61x^2 - 288x + 900$

$$\begin{array}{r|rrrrr} 6i & 1 & -8 & 61 & -288 & 900 \\ & \downarrow & 6i & -48i-36 & 288+150i & -900 \\ \hline -6i & 1 & -8+6i & -48i+25 & 150i & \\ & \downarrow & -6i & 48i & -150i & \\ \hline & 1 & -8+12i & -23 & 0 & \\ & & \downarrow & & & \\ & & & 1 & -8 & 25 \\ & & & & & \downarrow \\ & & & & & 1x^2 - 8x + 25 \end{array}$$

$x = \frac{8 \pm \sqrt{64 - 4(1)(25)}}{2(1)} = \frac{8 \pm \sqrt{-36}}{2} = \frac{8 \pm 6i}{2} = \boxed{4 \pm 3i, \pm 6i}$

$$\begin{aligned} 6i(-8+6i) &= -48i + 36i^2 \\ &= -48i - 36 \\ 6i(-48i+25) &= -288i^2 + 150i \\ &= 288 + 150i \end{aligned}$$

8. $4i, f(x) = x^4 + 13x^2 - 48$

$$\begin{array}{r|rrrrr} 4i & 1 & 0 & 13 & 0 & -48 \\ & \downarrow & +4i & -16 & -12i & 48 \\ \hline -4i & 1 & +4i & -3 & -12i & \\ & \downarrow & -4i & 8 & 12i & \\ \hline & 1 & 0 & -3 & 0 & \\ & & & \downarrow & & \\ & & & & & 1x^2 + 0x - 3 \end{array}$$

$x^2 - 3 = 0$
 $\sqrt{x^2 - 3}$
 $x = \pm\sqrt{3}, \pm 4i$

9. $3i, f(x) = x^3 + x^2 + 9x + 9$

$$\begin{array}{r|rrrr} 3i & 1 & 1 & 9 & 9 \\ & \downarrow & 3i & 3i-9 & -9 \\ \hline -3i & 1 & 1+3i & 3i & 0 \\ & \downarrow & -3i & -3i & \\ \hline & 1 & 1 & 0 & \\ & & & \downarrow & \\ & & & & 1x + 1 \end{array}$$

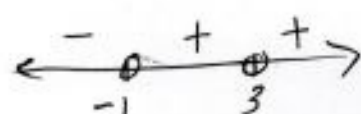
$3i(1+3i) = 3i + 9i^2 = 3i - 9$

$x + 1 = 0$
 $x = \boxed{-1, \pm 3i}$

Find the solution interval for the following. (graph)

10. $x^3 - 4x^2 - x + 4 \leq 0$

11. $(x+1)(x-3)^2 > 0$



$(-\infty, -1] \cup [1, 4]$

$(-1, 3) \cup (3, \infty)$

Convert the radical to exponent form and vice versa:

12. $(\sqrt{x})^4 = x^{4/3}$

13. $x^{8/3} = \sqrt[3]{x^8}$ or $\sqrt[3]{x^8}$

Solve the following equations, check for extraneous solutions:

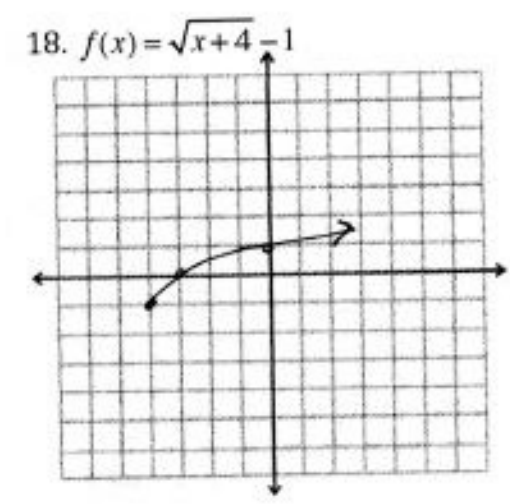
14. $(\sqrt{x-1})^2 = 5^2$
 $x-1 = 25$
 $x = 26$

15. $(x-6)^2 = (\sqrt{18-3x})^2$
 $x^2 - 12x + 36 = 18 - 3x$
 $x^2 - 9x + 18 = 0$
 $(x-6)(x-3) = 0$
 $x = 6$ or $x = 3$
 check: $6-6 = \sqrt{18-3(6)}$
 $0 = \sqrt{18-18}$
 $0 = 0$ ✓
 $3-6 = \sqrt{18-3(3)}$
 $-3 = \sqrt{9}$
 $-3 \neq 3$

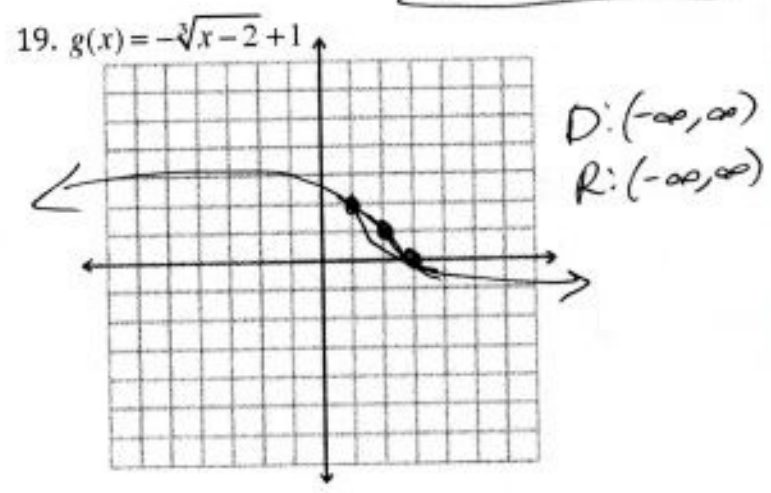
16. $(x+4)^{1/2} = 6$
 $(\sqrt{x+4})^2 = 6^2$
 $x+4 = 36$
 $x = 32$

17. $(x-6)^{1/2} = x-2$
 $(\sqrt{x-6})^2 = (x-2)^2$
 $x-6 = x^2 - 4x + 4$
 $0 = x^2 - 5x + 10$
 $x = \frac{5 \pm \sqrt{25 - 4(1)(10)}}{2(1)} = \frac{5 \pm \sqrt{-15}}{2}$
 No real solution

Graph the following and state the domain and range:

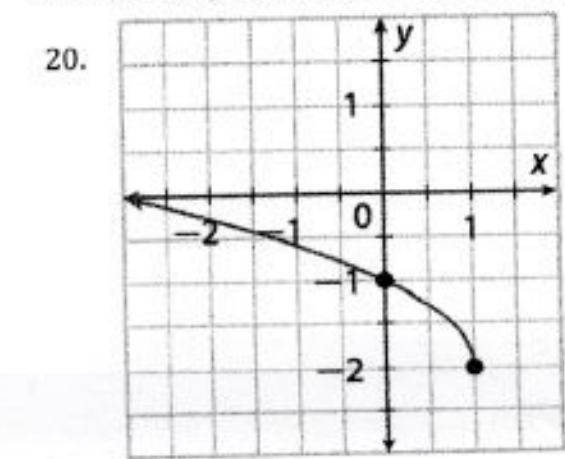


D: $[-4, \infty)$
 R: $[-1, \infty)$

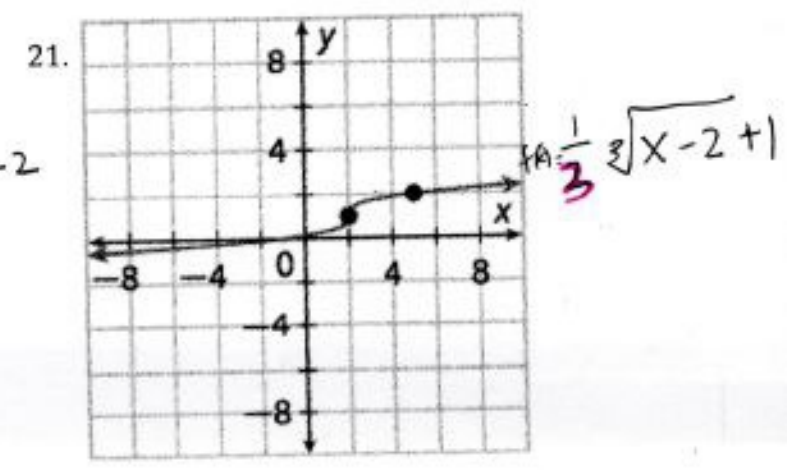


D: $(-\infty, \infty)$
 R: $(-\infty, \infty)$

Write the equation for the following graphs:



$f(x) = \sqrt{-x-1} - 2$



$f(x) = \sqrt[3]{x-2} + 1$

Solve the following rational equations. Be cautious of extraneous solutions.

22. $\frac{2x}{x+1} + \frac{1}{x-3} = \frac{2}{(x-1)(x-3)}$

$$2x^2 - 6x + x - 1 = 2$$

$$2x^2 - 5x - 3 = 0$$

$$(2x^2 + x)(x - 3) = 0$$

$$x(2x+1) - 3(2x+1) = 0$$

$$(2x+1)(x-3) = 0$$

$x = -\frac{1}{2}$ (crossed out)

23. $\frac{x+1}{x-6} = \frac{5x-2}{x-2} + \frac{16}{x-2}$

$$2x+2 = 5x^2 - 10x + 16$$

$$-2x - 2 = 5x^2 - 10x + 16$$

$$0 = 5x^2 - 12x + 4$$

$$0 = (5x-2)(x-2)$$

$$0 = x(5x-2) - 2(5x-2)$$

$$0 = (5x-2)(x-2)$$

$x = \frac{2}{5}$ (crossed out)

Perform the following operations. List excluded values.

24. Divide $\frac{x+2}{x-4} \div \frac{3x-12}{3(x-4)}$

$$\frac{x+2}{x-4} \cdot \frac{3(x-4)}{x} = \frac{3(x+2)}{x}$$

$x \neq 4, 0$

25. Multiply $\frac{(x-5)(x+1)}{3(x-5)} \cdot \frac{4}{(x-3)(x+1)}$

$$\frac{4}{3(x-3)}, x \neq 5, 3, -1$$

26. $\frac{1 \cdot x(3-x)(3+x)}{(3+x) \cdot x(3+x)}$

$$\frac{x + 9 - x^2}{x(3+x)} = \frac{-x^2 + x + 9}{x(3+x)}, x \neq 0, -3$$

27. $\frac{4}{(x+1)(x-1)} - \frac{x+2}{x-1} \cdot \frac{(x+1)}{(x+1)}$

$$\frac{4 - (x^2 + 3x + 2)}{(x-1)(x+1)}$$

$$\frac{4 - x^2 - 3x - 2}{(x+1)(x-1)} = \frac{-x^2 - 3x + 2}{(x+1)(x-1)}$$

28. Fred is kayaking on a river. He travels 8 miles upstream and 8 miles downstream in a total of 20 hours. In still water, Fred can travel at an average speed of 2 miles per hour. What is the average speed of the river's current?

$$20 = \frac{8}{2-x} + \frac{8}{2+x}$$

$$20(4-x^2) = 16 + 8x + 16 - 8x$$

$$80 - 20x^2 = 32$$

$$-80 - 20x^2 = -48$$

$$-20x^2 = -48$$

$$x^2 = 2.4$$

$$x = 1.5 \text{ mph}$$

Find the inverse of the following:

29. $f(x) = \frac{2x-3}{x+1}$

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

$$xy + x = 2y - 3$$

$$xy - 2y = -3 - x$$

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

$$y = \frac{-3-x}{x-2}$$

OR

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

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

$$x = \frac{y+3}{3y-4}$$

$$3xy - 4x = y + 3$$

$$3xy - y = 4x + 3$$

$$y(3x-1) = 4x+3$$

$$y = \frac{4x+3}{3x-1}$$

OR

$$-4x-3 = y-3xy$$

$$\frac{-4x-3}{1-3x} = y$$