

Quiz Review: Rational Root Theorem

Name _____

1. Solve using the Quadratic Formula. Write your answer in simplest radical form.

$$0 = x^2 - 6x + 6$$

2. Use LONG division.

$$\frac{x^3 - 2x + 5}{x - 3}$$

3. Use SYNTHETIC division

$$\frac{x^4 - 2x^2 + 3x + 8}{x + 5}$$

4. Identify the following features and graph: $y = (x - 3)(x + 2)^2(x + 4)$

Degree, End Behavior, x-intercept(s), y-intercept, and then graph

5. List the *possible* rational roots. You do not need to identify which are actually solutions.

$$y = 2x^5 - 9x^4 + 5x^2 + 3x - 10$$

6. Use the Rational Root Theorem to factor completely. Then graph making notes off all intercepts.

$$y = x^4 - x^3 - 22x^2 - 44x - 24$$

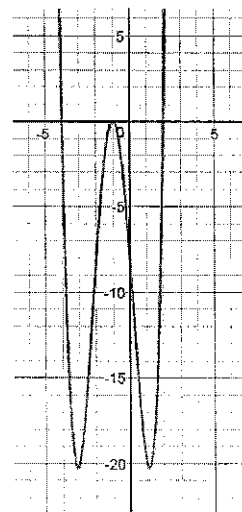
7. Solve. List all REAL solutions.

$$0 = x^3 - 2x^2 + 25x - 50$$

8. Solve. List ALL solutions.

$$0 = x^3 - 3x^2 + 4x - 12$$

9. Write, in factored form, the equation of the graph shown.



Quiz Review Solns - Rational Root Thm

Be sure to have the quadratic formula memorized!

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{6 \pm \sqrt{(-6)^2 - 4 \cdot 1 \cdot 6}}{2 \cdot 1} = \frac{6 \pm \sqrt{36 - 24}}{2} = \frac{6 \pm \sqrt{12}}{2}$$

$$\frac{\sqrt{12}}{\sqrt{4 \cdot 3}} = 2\sqrt{3} \quad = \frac{6 \pm 2\sqrt{3}}{2} = \boxed{3 \pm \sqrt{3}}$$

2.
$$\boxed{x^2 + 3x + 7 + \frac{26}{x-3}}$$

$(x-3) \overline{) x^3 + 0x^2 - 2x + 5}$

$$\begin{array}{r} x^3 + 0x^2 - 2x + 5 \\ -x^3 + 3x^2 \\ \hline 3x^2 - 2x \\ -3x^2 + 9x \\ \hline 7x + 5 \\ -7x + 21 \\ \hline 26 \end{array}$$

3.
$$\begin{array}{r|rrrrrr} -5 & 1 & 0 & -2 & 3 & 8 \\ & & -5 & 25 & -15 & +56 \\ \hline & 1 & -5 & 23 & -12 & 568 \end{array}$$

\downarrow
 x
 $\frac{112}{5}$
 $\frac{568}{5}$

Final answer:
 $x^3 - 5x^2 + 23x - 112 + \frac{568}{x+5}$

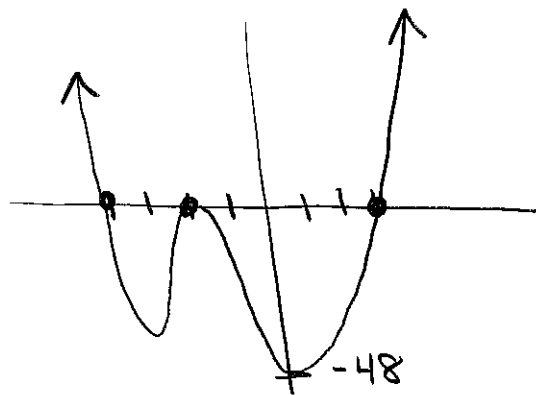
4. $y = (x-3)(x+2)^2(x+4)$

Degree is 4, $\uparrow \uparrow$

x-int: 3, -2, -4

Bounce!

y-int: $(-3)(2)^2(4) = -3 \cdot 4 \cdot 4 = -48$



5. p's / q's

$$\begin{array}{l} \pm 1 \quad \pm 2 \quad \pm 5 \quad \pm 10 \\ \hline \pm 1 \quad \pm 2 \quad \pm 5 \quad \pm 10 \\ \pm 2 \quad \pm 1/2 \quad \pm 5/2 \quad \pm 5 \end{array}$$

6. $y = x^4 - x^3 - 22x^2 - 44x - 24$

* Check factors like: $\pm 1, \pm 2, \pm 3, \pm 4$

$$\begin{array}{r|rrrrr} 1 & 1 & -1 & -22 & -44 & -24 \\ & & 1 & 0 & -22 & -66 \\ \hline & 1 & 0 & -22 & -66 & \times \end{array}$$

$$\begin{array}{r|rrrrr} -1 & 1 & -1 & -22 & -44 & -24 \\ & & -1 & 2 & 20 & 24 \\ \hline & 1 & -2 & -20 & -24 & 0 \checkmark \end{array}$$

factor: $(x+1)$

$$\begin{array}{r|rrrr} -1 & 1 & -2 & -20 & -24 \\ & & -1 & 3 & 17 \\ \hline & 1 & -3 & -17 & \end{array}$$

$$\begin{array}{r|rrrrr} 2 & 1 & -2 & -20 & -24 & -2 \\ & & 2 & 2 & 36 & \\ \hline & 1 & 0 & -18 & \times & \checkmark \end{array}$$

factor: $(x+2)$

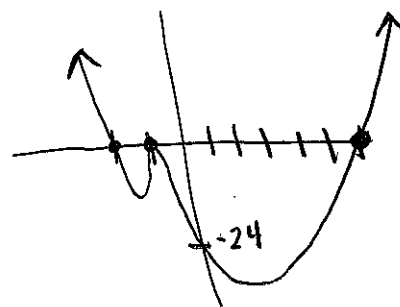
$$\begin{array}{r|rrrr} 1 & 1 & -2 & -20 & -24 \\ & & -2 & 8 & 24 \\ \hline & 1 & -4 & -12 & 0 \checkmark \end{array}$$

$x^2 - 4x - 12$

$(x+1)(x+2)(x^2 - 4x - 12)$

$(x+1)(x+2)(x-6)(x+2)$
or
 $(x+1)(x-6)(x+2)^2$

x-int: $-1, 6, -2^*$
y-int: -24



7. $0 = x^3 - 2x^2 + 25x - 50$

$$\begin{array}{r|rrrr} 1 & 1 & -2 & 25 & -50 \\ & & 1 & -1 & 24 \\ \hline & 1 & -1 & 24 & \times \end{array}$$

$$\begin{array}{r|rrrr} -1 & 1 & -2 & 25 & -50 \\ & & -1 & 3 & -28 \\ \hline & 1 & -3 & 28 & \end{array}$$

$$\begin{array}{r|rrrr} 2 & 1 & -2 & 25 & -50 \\ & & 2 & 0 & 50 \\ \hline & 1 & 0 & 25 & 0 \checkmark \end{array}$$

$(x-2)(x^2 + 25)$

real soln = 2

no real solns



only real soln is 2

8. $0 = x^3 - 3x^2 + 4x - 12$

$$\begin{array}{r|rrrr} 1 & 1 & -3 & 4 & -12 \\ & & 1 & -2 & 2 \\ \hline & 1 & -2 & 2 & \end{array}$$

$$\begin{array}{r|rrrr} -1 & 1 & -3 & 4 & -12 \\ & & -1 & 4 & -8 \\ \hline & 1 & -4 & 8 & \end{array}$$

$$\begin{array}{r|rrrr} 2 & 1 & -3 & 4 & -12 \\ & & 2 & -2 & 4 \\ \hline & 1 & -1 & 2 & -8 \end{array}$$

$$\begin{array}{r|rrrr} -2 & 1 & -3 & 4 & -12 \\ & & -2 & 10 & -28 \\ \hline & 1 & -5 & 14 & \end{array}$$

$$\begin{array}{r|rrrr} 1 & 1 & -3 & 4 & -12 \\ & & 3 & 0 & 12 \\ \hline & 1 & 0 & 4 & 0 \checkmark \end{array}$$

$(x-3)(x^2 + 4)$

$x-3=0$

$x^2+4=0$

$x=3$

$x = \pm 2i$

we can solve since we're not restricted to reals!

9. $x: -4, -1^*, 2$

$y = (x+4)(x+1)^2(x-2)$