

3.3 Find the product (5 pts) 18. $[x - (3 - \sqrt{5})][x - (3 + \sqrt{5})]$

$$\begin{aligned}
 &= x^2 - (3 + \sqrt{5})x - (3 - \sqrt{5})x - (3 - \sqrt{5})(3 + \sqrt{5}) \\
 &= x^2 - (3x + \sqrt{5}x) - (3x - \sqrt{5}x) - (9 + 3\sqrt{5} - 3\sqrt{5} - \sqrt{5}\sqrt{5}) \\
 &= x^2 - 3x - \sqrt{5}x - 3x + \sqrt{5}x - (9 - 5) = x^2 - 6x - 4
 \end{aligned}$$

1. 3.3 Find a polynomial with real coefficients that has the given zero. (5 pts) Leave it in factored form: 28. $4 + i$

$$(x - (4 + i))(x - (4 - i))$$

2. 3.3 Use the Rational Zeros Theorem (3 pts) and Descartes's Rule of Signs (3 pts) to find all real and imaginary roots of the equation. Final answer: (4 pts).

67. $6x^3 + 25x^2 - 24x + 5 = 0$

$$\frac{p}{q}: \pm 1, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{1}{6}, \pm 5, \pm \frac{5}{2}, \pm \frac{5}{3}, \pm \frac{5}{6}$$

Descartes: 2 or 0 positive zeros

 $f(-x) = -6x^3 + 25x^2 + 24x + 5$: 1 negative zero

$$\begin{array}{r}
 -5 \overline{) 6 \quad 25 \quad -24 \quad 5} \\
 \underline{-30 \quad 25 \quad -5} \\
 6 \quad -5 \quad 1 \quad 0
 \end{array}$$

$6x^2 - 5x + 1 = 0$

$$\begin{aligned}
 b^2 - 4ac &= (-5)^2 - 4(6)(1) \\
 &= 25 - 24 = 1
 \end{aligned}$$

It factors!

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

$$x = \frac{1}{3}, \frac{1}{2}$$

$$\text{Real zeros (All)}: \boxed{x = -5, \frac{1}{3}, \frac{1}{2}}$$

$$f(x) = 6(x + 5)\left(x - \frac{1}{3}\right)\left(x - \frac{1}{2}\right)$$

If your homework is done, then there will be no wrong guesses here.

3. 3.4 Find all real solutions to the equation. (5 pts) Check your answers.

12. $\sqrt{x-1} = x-7$

$$(\sqrt{x-1})^2 = (x-7)^2$$

$$x-1 = x^2 - 14x + 49$$

$$x^2 - 15x + 50 = 0$$

$$(x-5)(x-10) = 0$$

$$x \in \{5, 10\}$$

→ No. Extraneous

$$\sqrt{5-1} \stackrel{?}{=} 5-7$$

$$2 \stackrel{?}{=} -2 \text{ No}$$

$$\sqrt{10-1} \stackrel{?}{=} 10-7$$

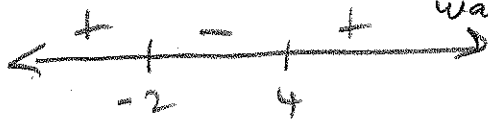
$$3 \stackrel{?}{=} 3 \checkmark$$

$$x \in \{10\}$$

4. 3.6 Solve the inequalities: (5 pts each)

95. $\frac{x-4}{x+2} \leq 0$

want ≤ 0
want "-"



$$x \in (-2, 4]$$

$$-2 \notin D$$

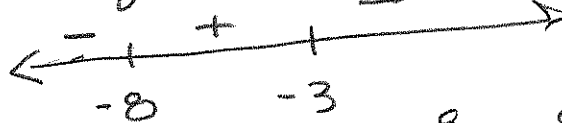
97. $\frac{q-2}{q+3} < 2 \cdot \frac{q+3}{q+3}$

$$\frac{q-2}{q-3} - \frac{2q+6}{q+3} < 0$$

$$\frac{q-2-2q-6}{q+3} < 0$$

$$\frac{-q-8}{q+3} < 0$$

want < 0
want "-"



Test: $x=0 : \frac{-8}{3} = -\frac{8}{3} < 0$

$$x \in (-\infty, -8) \cup (-3, \infty)$$