

Unit 1B Review**CCGPS Advanced Algebra**

Factor:

1. $x^3 - 64$

2. $x^2 - 36$

3. $2x^2 - x - 6$

4. $p^3 + 4p^2 - 9p - 36$

Find the possible rational zeros of:

5. $f(x) = 5x^5 - 4x^3 + 2x - 45$

6. $f(x) = 3x^4 - 5x^3 + 2x - 8$

Divide using synthetic division.

7. $f(x) = 2x^3 - x^2 - 7x + 6 \div (x + 2)$

8. $f(x) = x^4 - 2x^3 + 44x + 7 \div (x - 3)$

9. Is $(x - 2)$ a factor of the function $f(x) = 3x^3 - 2x + 4$? Use synthetic division to explain.10. One factor of $x^3 - 4x^2 + x + 6$ is $x - 3$. Find the other factors.11. When we say that the root $x = 7$ has a "multiplicity of 2," what do we mean?

Find all of the zeros of:

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

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

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

15. $f(x) = x^4 - 4x^3 + x^2 + 16x - 20$

16. Given the zeros: $2 - \sqrt{3}$, $4i$ what are the missing zeros? (Do Not Solve)

Write the polynomial with the following zeros:

17. -1 , 3 , & 5

18. -1 (with a multiplicity of 2) & i

19. -2 & $4i$

20. 3 , -3 , $-2i$

Unit 1 B Review

CCGPS Adv. Alg.

$$\textcircled{1} x^3 - 64 = \boxed{(x-4)(x^2+4x+16)}$$

$$\textcircled{2} x^2 - 36 = \boxed{(x-6)(x+6)}$$

$$\textcircled{3} \begin{array}{l} 2x^2 - x - 6 \\ \boxed{(2x+3)(x-2)} \end{array} \quad \begin{array}{l} (-4)(3) = -12 \\ (-4) + (3) = -1 \end{array}$$

* OR use grouping.

$$\textcircled{4} \begin{array}{l} (p^3 + 4p^2 - 9p - 36) \\ p^2(p+4) - 9(p+4) = \\ (p^2 - 9)(p+4) = \boxed{(p+3)(p-3)(p+4)} \end{array}$$

$$\textcircled{5} f(x) = 5x^5 - 4x^3 + 2x - 45$$

$p = \text{constant factors} = \pm 1, 3, 5, 9, 15, 45$
 $q = \text{leading coef. factors} = \pm 1, 5$

$$\boxed{\frac{p}{q} = \pm 1, 3, 5, 9, 15, 45, \frac{1}{5}, \frac{3}{5}, \frac{9}{5}}$$

* only list possibilities - do not solve.

$$\textcircled{6} f(x) = 3x^4 - 5x^3 + 2x - 8$$

$$p = 8 = \pm 1, 2, 4 \quad \text{and } + \text{ or } - 8$$

$$q = \pm 1, 3$$

$$\boxed{\frac{p}{q} = \pm 1, 2, 4, \frac{1}{3}, \frac{2}{3}, \frac{4}{3}} \quad * \text{ only list possibilities}$$

also $\frac{8}{3}$

$$\textcircled{7} \quad \begin{array}{r} -2 \overline{) 2 \quad -1 \quad -7 \quad 6} \\ \underline{ 2 \quad -4 \quad 10 \quad -6} \\ 3 \quad 0 \end{array} = \boxed{2x^2 - 5x + 3}$$

$$\textcircled{8} \quad \begin{array}{r} 3 \overline{) 1 \quad -2 \quad 0 \quad 44 \quad 7} \\ \underline{ 3 \quad 3 \quad 9 \quad 159} \\ 53 \quad 166 \end{array}$$

$$= \boxed{x^3 + x^2 + 3x + 53 + \frac{166}{x-3}}$$

$$\textcircled{9} \quad \begin{array}{r} 2 \overline{) 3 \quad 0 \quad -2 \quad 4} \\ \underline{ 6 \quad 12 \quad 20} \\ 10 \quad 24 \end{array}$$

$(x-2)$ is not a factor because the remainder does not equal zero.

$$\textcircled{10} \quad \begin{array}{r} 3 \overline{) 1 \quad -4 \quad 1 \quad 6} \\ \underline{ 3 \quad -3 \quad 7} \\ 0 \end{array} = x^2 - x - 2 = \boxed{(x-2)(x+1)}$$

$\textcircled{11}$ We mean that 7 is a root twice. It can also be called a double root. The graph hits the x-axis at 7 and bounces off the axis.

$\textcircled{12}$ $\boxed{-2, -1, 2}$ \rightarrow you can see them all on the graph

⑬ - Find p's + q's $p = \pm 1, 3$ $q = \pm 1, 3, \frac{1}{2}, \frac{3}{2}, \frac{1}{4}, \frac{3}{4}$
 $q = \pm 1, 2, 4$
 $\frac{3}{4}$ gives me 0.

- go to table

- divide by $\frac{3}{4}$

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

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

$$4x^2 = -4$$

$$x^2 = -1$$

$$x = \pm i$$

Roots $\frac{3}{4}, i, -i$

⑭ $-2, -2, -1, 1$

(-2 is a double root or has multiplicity of 2)

⑮ $2, -2$ $\begin{array}{r|rrrrr} 2 & 1 & -4 & 1 & 16 & -20 \\ & & 2 & -4 & -6 & 20 \\ \hline & 1 & -2 & -3 & 10 & 0 \end{array}$

$$\begin{array}{r|rrrr} -2 & 1 & -2 & -3 & 10 \\ & & -2 & 8 & -10 \\ \hline & 1 & -4 & 5 & 0 \end{array}$$

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

$$\frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(5)}}{2(1)} =$$

$$\frac{4 \pm \sqrt{16 - 20}}{2} = \frac{4 \pm \sqrt{-4}}{2} = \frac{4 \pm 2i}{2}$$

$$= 2 \pm i$$

Roots

$2, -2, 2+i, 2-i$

⑩ If $2 - \sqrt{3}$ and $4i$ are roots, then $2 + \sqrt{3}$ and $-4i$ must also be roots.

⑪ Zeros: $-1, 3, 5$
Factors: $(x+1)(x-3)(x-5)$
 $= (x+1)(x^2 - 5x - 3x + 15)$
 $= (x+1)(x^2 - 8x + 15)$
 $= x^3 - 8x^2 + 15x + x^2 - 8x + 15$
 $= \boxed{x^3 - 7x^2 + 7x + 15}$

⑫ Zeros: $\underbrace{-1, -1}_{\text{multiplicity 2}}, \underbrace{i, -i}_{\text{conjugates}}$ Factors $(x+1)(x+1)(x-i)(x+i)$
 $= (x^2 + 1)(x+1)(x-i)(x+i)$
 $= (x^2 + 1)(x^2 + 1)$
 $= x^4 + x^2 + 2x^3 + 2x + x^2 + 1$
 $= \boxed{x^4 + 2x^3 + 2x^2 + 2x + 1}$

⑬ Zeros: $-2, 4i, -4i$
Factors: $(x+2)(x-4i)(x+4i)$
 $= (x+2)(x^2 + 4ix - 4ix - 16i^2)$
 $= (x+2)(x^2 + 16)$
 $= \boxed{x^3 + 2x^2 + 16x + 32}$

⑭ Zeros: $3, -3, -2i, 2i$
Factors: $(x-3)(x+3)(x+2i)(x-2i)$
 $= (x^2 + 3x - 3x - 9)(x^2 - 2ix + 2ix - 4i^2)$
 $= (x^2 - 9)(x^2 + 4)$
 $= x^4 + 4x^2 - 9x^2 - 36$
 $= \boxed{x^4 - 5x^2 - 36}$