

Unit 3B Test Review

1) Given the factor $(x - 6)$, what are the other linear factors for the polynomial $f(x) = 2x^3 - 1x^2 - 52x - 84$? $x=6$

$$\begin{array}{r} 6 \overline{) 2 \quad -1 \quad -52 \quad -84} \\ \underline{\downarrow 12 \quad 66 \quad 84} \\ 2 \quad 11 \quad 14 \quad \underline{0} \\ 2x^2 + 11x + 14 \end{array}$$

$(2x + 7)(x + 2)$

2) What is the y-intercept of the function $f(x) = 4x^3 - 7x^2 + 8x$?

$y=0; (0,0)$

3) Given the polynomial $f(x) = 8x^3 - 125$, what are its factors?

$(2x - 5)(4x^2 + 10x + 25)$

Write the equations of the polynomials given the following zeros:

4) $5, \pm 7i$ $(x-5)(x+7i)(x-7i)$

$(x-5)(x^2+49)$
 $x^3 + 49x - 5x^2 - 245$
 $x^3 - 5x^2 + 49x - 245$

5) $-3, \pm\sqrt{2}$

$(x+3)(x+\sqrt{2})(x-\sqrt{2})$
 $(x+3)(x^2-2)$
 $x^3 - 2x + 3x^2 - 6$
 $x^3 + 3x^2 - 2x - 6$

6) True or false: Every odd-degree polynomial has at least two imaginary roots.

False. $x^3=0$ does not have imaginary roots.

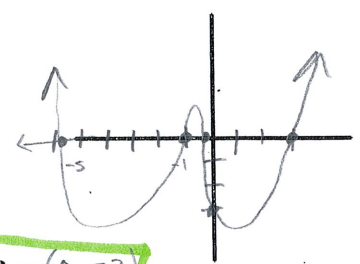
For 7-12, **give exact answers only.** No Decimals. Write final answer for the zeros, roots, solutions, or factors in the space provided. Draw a sketch showing **all intercepts (x & y)** on 7 & 8.

Find the x and y-intercepts and graph a sketch.

7) $f(x) = x^4 + 4x^3 - 14x^2 - 20x - 3$ $-1, 3$

$$\begin{array}{r} -1 \overline{) 1 \quad 4 \quad -14 \quad -20 \quad -3} \\ \underline{\downarrow -1 \quad -3 \quad 17 \quad 3} \\ 3 \overline{) 1 \quad 3 \quad -17 \quad -3 \quad 0} \\ \underline{\downarrow 3 \quad 18 \quad 3} \\ 1 \quad 6 \quad 1 \quad \underline{0} \end{array}$$

$x^2 + 6x + 1$
 $\frac{-6 \pm \sqrt{36-4}}{2} = \frac{-6 \pm \sqrt{32}}{2}$
 $= \frac{-6 \pm 4\sqrt{2}}{2} = \frac{-6}{2} \pm \frac{4\sqrt{2}}{2} = -3 \pm 2\sqrt{2}$



x-intercepts & y-intercepts = $(0, -3)$
 $-1, 3, -3 + 2\sqrt{2}, -3 - 2\sqrt{2}$
 $-.17 \quad -5.83$

8) Find all the zeros: *even*

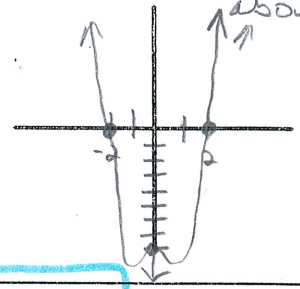
$$f(x) = x^4 - 2x^2 - 8$$

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

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

$$x = -2 \quad x = 2 \quad x = \pm i\sqrt{2}$$

even function \Rightarrow symmetrical about y-axis



$$y\text{-int} = (0, -8)$$

Zeros

$$-2, 2, i\sqrt{2}, -i\sqrt{2}$$

9) Find all the **linear factors**

$$f(x) = 2x^4 - 5x^3 - 17x^2 + 35x + 21 \quad x = 3$$

$$\begin{array}{r|rrrrrr} 3 & 2 & -5 & -17 & 35 & 21 \\ & \downarrow & & & & \\ & 2 & 1 & -14 & -7 & 0 \end{array}$$

$$(2x^3 + x^2 - 14x - 7)$$

$$x^2(2x+1) - 7(2x+1)$$

$$(x^2 - 7)(2x+1)$$

$$(x+\sqrt{7})(x-\sqrt{7})(2x+1)(x-3)$$

Factors

$$(x-3)(2x+1)(x+\sqrt{7})(x-\sqrt{7})$$

11) Find all the **roots**

$$f(x) = x^3 + 64$$

$$(x+4)(x^2 - 4x + 16)$$

$$x = -4 \quad +4 \pm \frac{\sqrt{16 - 4(1)(16)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{-48}}{2}$$

$$= \frac{4 \pm 4i\sqrt{3}}{2}$$

$$= 2 \pm 2i\sqrt{3}$$

Roots

$$-4, 2 + 2i\sqrt{3}, 2 - 2i\sqrt{3}$$

10) Find all the **zeros**

$$f(x) = x^4 + 3x^3 - 3x^2 - 15x - 10 \quad x = -1, -2$$

$$\begin{array}{r|rrrrrr} -1 & 1 & 3 & -3 & -15 & -10 \\ & \downarrow & & & & \\ & 1 & 2 & -5 & -10 & 0 \\ -2 & 1 & 2 & -5 & -10 & 0 \\ & \downarrow & & & & \\ & 1 & 0 & -5 & 0 & \end{array}$$

$$x^2 - 5$$

$$\sqrt{x^2 = 5}$$

$$x = \pm\sqrt{5}$$

Zeros

$$-2, -1, \pm\sqrt{5}$$

12) Find all of the **solutions**

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

$$x(x^3 - 2x^2 - 3x + 6)$$

$$x(x^2 - 2x^2 - 3x + 6)$$

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

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

$$x=0 \quad x=2 \quad \sqrt{x^2=3}$$

$$x = \pm\sqrt{3}$$

Solutions

$$0, 2, \pm\sqrt{3}$$