5.2 Practice – Poly Division and Factor Theorems Name: Solutions

Pre-Calculus

For 1-3, use long division to divide the polynomials.

1. $(2x^2 - 7x + 4) \div (x - 2)$

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

2. $(y^2 - 9) \div (y + 1)$

$$y - 1 - \frac{8}{y+1}$$

3. $(9x^5 - 3x^3 + 21x^2 - 2x + 4) \div (3x^2 + 1)$

$$3x^3 - 2x + 7 - \frac{3}{3x^2+1}$$

For 4-6, use synthetic division to divide the polynomials

4. $(x^2 + 3x - 3) \div (x - 3)$

$$x + 6 + \frac{15}{x-3}$$

5. $(7x^6 + 50x^3 + 20x) \div (x + 2)$

$$7x^5 - 14x^4 + 28x^3 - 6x^2 + 12x - 4 + \frac{8}{x+2}$$

6. $(3x^4 - 4x^2 + 1) \div (x + 1)$

$$3x^3 - 3x^2 - x + 1$$

7. If $(x + 1)$ is a factor of $2x^5 + 2x^4 - 5x^3 - 5x^2 - 3x - 3$, what are all the factors of $f(x)$.

$$(2x^2+1)(x^2-3)(x+1)$$

8. Is $(x - 11)$ a factor of $(3x^4 - 33x^3 - 17x^2 + 187x - 11)$?

No!

9. If $(3x+5)$ is a factor of $6x^3+31x^2+23x-20$, what are all the factors of $f(x)$.

$-\frac{5}{3}$ | 6 31 23 −20
| −10 −35 20
6 21 −12 0

$\div 3 \rightarrow 2x^2+7x-4$

$(2x-1)(x+4)$ and $(3x+5)$

10. Is $(n+1)$ a factor of $(6n^3+6n^2)$?

−1 | 6 6 0 0
| −6 0 0
6 0 0 0

Yes!

For 11-14, a zero of the function is given. Find ALL the zeros of the function.

11. $f(x)=4x^3-25x^2-154x+40;\ f(10)=0$

10 | 4 −25 −154 40
| 40 150 −40
4 15 −4 0

$4x^2+15x-4=0$

$(4x-1)(x+4)=0$

$4x-1=0 \qquad x+4=0$

$x=10, \frac{1}{4}, -4$

12. $f(x)=3x^3+34x^2+72x-64;\ f(-4)=0$

−4 | 3 34 72 −64
| −12 −88 64
3 22 −16 0

$3x^2+22x-16=0$

$(3x-2)(x+8)=0$

$x=-4, \frac{2}{3}, -8$

13. $f(x)=x^5+2x^4+7x^3+14x^2+6x+12$
$f(-2)=0$

−2 | 1 2 7 14 6 12
| −2 0 −14 0 −12
1 0 7 0 6 0

$x^4+7x^2+6=0$

$(x^2+6)(x^2+1)=0$

$x^2=-6 \qquad x^2=-1$

$x=-2, \pm i\sqrt{6}, \pm i$

14. $f(x)=x^3-125;\ f(5)=0$

5 | 1 0 0 −125
| 5 25 125
1 5 25 0

$x^2+5x+25=0$

$x=\frac{-5\pm\sqrt{25-4(1)25}}{2}$

$x=5, \frac{-5\pm 5i\sqrt{3}}{2}$

For 15-16, use the graph of the function to determine at least one zero, then find the exact values of all the zeros using the Factor Theorem.

15. $f(x) = 3x^4 + 16x^3 - 8x^2 - 112x - 91$

$-1 \mid 3 \;\; 16 \;\; -8 \;\; -112 \;\; -91$
$\quad\quad -3 \;\; -13 \;\; 21 \;\; 91$
$\quad 3 \;\; 13 \;\; -21 \;\; -91 \;\; 0$

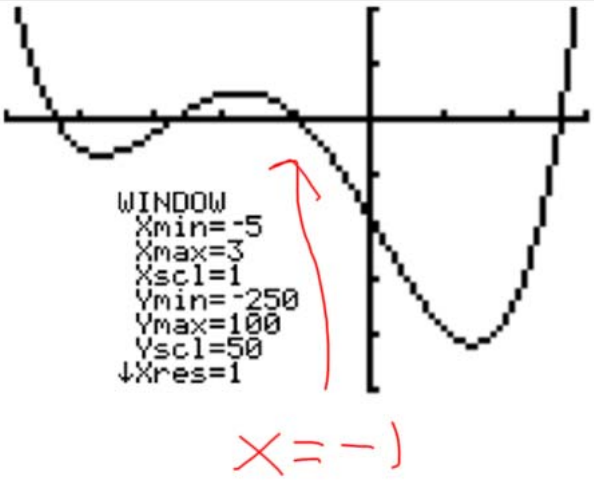
$3x^3 + 13x^2 - 21x - 91 = 0$

$x^2(3x+13) - 7(3x+13) = 0$

$(x^2 - 7)(3x+13) = 0$

$x^2 = 7 \quad 3x = -13$

$x = -1, \pm\sqrt{7}, -\frac{13}{3}$



16. $f(x) = 10x^3 - 31x^2 - 76x + 160$

$4 \mid 10 \;\; -31 \;\; -76 \;\; 160$
$\quad\quad 40 \;\; 36 \;\; -160$
$\quad 10 \;\; 9 \;\; -40 \;\; 0$

$10x^2 + 9x - 40 = 0$

$10x^2 + 25x - 16x - 40 = 0$

$5x(2x+5) - 8(2x+5) = 0$

$(2x+5)(5x-8) = 0$

$x = 4, -\frac{5}{2}, \frac{8}{5}$

For 17-20, one zero is given of $f(x)$. List one other zero.

17. $13 - 25i$	18. $10i$	19. $3i + 1$	20. $\sqrt{7} + 14i$
$13 + 25i$	$-10i$	$-3i + 1$	$\sqrt{7} - 14i$

Skills Review: Find the x- and y-intercepts for each function. SHOW ALL WORK!

1. $12x - 5y = 60$

x-int:

$12x - 5(0) = 60$

$12x = 60$

$x = 5$

y-int:

$12(0) - 5y = 60$

$-5y = 60$

$y = -12$

2. $f(x) = \frac{x^2+x-6}{4x-4}$

x-int:

$0 = \frac{x^2+x-6}{4x-4}$

$0 = x^2 + x - 6$

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

$x = -3, 2$

y-int:

$y = \frac{0+0-6}{4(0)-4}$

$y = \frac{-6}{-4}$

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