Name $\underline{\text{Answer Key}}$

PreCalculus; Sec 2.3b – Real Zeros of Polynomial Functions

1. Two forms of the Division Algorithm are shown below. Identify and label each part.

$f(x) = d(x)q(x) + r(x)$

DIVIDEND DIVISOR QUOTIENT REMAINDER.

$\frac{f(x)}{d(x)} = q(x) + \frac{r(x)}{d(x)}$

DIVIDEND DIVISOR QUOTIENT REMAINDER

2. The rational expression $\frac{p(x)}{q(x)}$ is called __Improper__ when the degree of the numerator is greater than or equal to that of the denominator.

3. Every rational zero of a polynomial function with integer coefficients has the form $\frac{p}{q}$, where p is a factor of the __CONSTANT (TERM)__ and q is a factor of the __LEADING COEFFICIENT__.

4. You divide the polynomial $f(x)$ by $(x - 4)$ and get an answer of 7. What is $f(4)$?

$f(4) = 7$

Use either long division or synthetic division to divide.

5. Divide $x^3 - 4x^2 - 17x + 6$ by $x - 3$

3	1	-4	-17	6
		3	-3	-60
	1	-1	-20	-54

$\boxed{x^2 - x - 20 - \frac{54}{x-3}}$

6. $(5x^3 + 6x + 8) \div (x + 2)$

-2	5	0	6	8
		-10	20	-52
	5	-10	26	-44

$\boxed{5x^2 - 10x + 26 - \frac{44}{x+2}}$

Use the Remainder Theorem and synthetic division to evaluate the function at each given value.

7. $f(x) = 4x^4 - 16x^3 + 7x^2 + 20$

a. $f(1)$

1	4	-16	7	0	20
		4	-12	-5	-5
	4	-12	-5	-5	$\boxed{15}$

b. $f(-2)$

-2	4	-16	7	0	20
		-8	48	-110	220
	4	-24	55	-110	$\boxed{240}$

c. $f(5)$

5	4	-16	7	0	20
		20	20	135	675
	4	4	27	135	$\boxed{695}$

d. $f(-10)$

-10	4	-16	7	0	20
		-40	560	-5670	56700
	4	-56	567	-5670	$\boxed{56720}$

In Exercise 8, (a) verify the given factor(s) of the function f, (b) find the remaining factors of f, (c) write the complete factorization of f, and (d) list all real zeros of f.

8. $f(x) = 6x^3 + 41x^2 - 9x - 14$ Factors: $(2x + 1)$

a) $-\frac{1}{2}$ | 6 41 -9 -14
-3 -19 14
6 38 -28 0

B) $6x^2 + 38x - 28$

$2(3x^2 + 19x - 14)$

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

c) $f(x) = 2(3x-2)(x+7)(x+\frac{1}{2})$

D) $x = \frac{2}{3}, -7, -\frac{1}{2}$

OR

a) $2x+1 \overline{)6x^3+41x^2-9x-14}$ quotient $3x^2+19x-14$

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

$38x^2-9x-14$

$-(38x^2+19x)$

$-28x-14$

$-(-28x-14)$

0

B) $3x^2+19x-14$

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

c) $f(x) = (2x+1)(3x-2)(x+7)$

D) $x = -\frac{1}{2}, \frac{2}{3}, -7$

Find all real zeros of the polynomial function. (*Hint:* you may need to use the Rational Zero Test.)

9. $h(x) = x^5 - x^4 - 3x^3 + 5x^2 - 2x$

$x(x^4 - x^3 - 3x^2 + 5x - 2) = 0$

$\boxed{x=0}$

$\frac{P}{Q} = \pm\frac{1, 2}{1}$

$\boxed{-2}$ | 1 -1 -3 5 -2
-2 6 -6 2
$\boxed{1}$ | 1 -3 3 -1 0
1 -2 1
1 -2 1 0

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

$(x-1)^2 = 0$

$\boxed{x=1}$