Chapter 5 Review Worksheet

Name: KEY

Simplify the expression. Evaluate all powers with numerical bases. NO DECIMALS.

1.) $(x^{-2}y^5)^2$

$x^{-4}y^{10}$

$\boxed{\frac{y^{10}}{x^4}}$

2.) $(3x^4y^{-2})^{-3}$

$3^{-3}x^{-12}y^6$

$\frac{y^6}{3^3x^{12}}$

$\boxed{\frac{y^6}{27x^{12}}}$

3.) $\frac{2x^{-6}y^5}{16x^3y^{-2}}$

$\frac{2x^{-9}y^7}{16}$

$\boxed{\frac{y^7}{8x^9}}$

4.) $\frac{(3m^{-2}n^4)^{-3}}{9m^3n^{-3}} \cdot \frac{m^{-6}}{n^8}$

$\frac{3^{-3}m^6n^{-12}}{9m^3n^{-3}} \cdot \frac{m^{-6}}{n^8}$

$\frac{3^{-3}n^{-12}}{9m^3n^5}$

$\frac{3^{-3}n^{-17}}{9m^3}$

$\frac{1}{3^3 \cdot 9m^3n^{17}}$

$\boxed{\frac{1}{243m^3n^{17}}}$

5.) $\frac{5a^3}{(10b)^2} \cdot \frac{b^{-5}a^2}{a^7b^0}$

$\frac{5a^3}{100b^2} \cdot \frac{b^{-5}a^2}{a^7}$

$\frac{5a^5b^{-5}}{100a^7b^2}$

$\frac{5a^{-2}b^{-7}}{100}$

$\boxed{\frac{1}{20a^2b^7}}$

6.) $(2x^{-2}y^7)(12x^{-6}y^{-3})$

$24x^{-8}y^4$

$\boxed{\frac{24y^4}{x^8}}$

Decide whether the function is a polynomial function. If so, write it in standard form and state its degree, type, and leading coefficient. If it is not a polynomial, explain why.

7.) $f(x) = x^4 - \frac{1}{4}x^2 + 3$

yes, polynomial.
SF: ✓
D: 4
Type: Quartic
LC: 1

8.) $h(x) = 5x^2 + 3x^{-1} - x$

no, not a polynomial.
cannot have negative exponents.

9.) $g(x) = x + 2^x - 0.6x^5$

no, not a polynomial.
cannot have variable exponents.

10.) $j(x) = 7x - \sqrt{3} + \pi x^2$

yes, polynomial.
SF: $j(x) = \pi x^2 + 7x - \sqrt{3}$
D: 2
Type: Quadratic
LC: π

Evaluate the function for the given value of x using <u>both</u> direct and synthetic substitution.

11.) $g(x) = 2x^4 - 5x^3 - 4x + 8$ when $x = 3$

$g(3) = 2(3)^4 - 5(3)^3 - 4(3) + 8$

$= 162 - 135 - 12 + 8$

$\boxed{g(3) = 23}$

3	2	-5	0	-4	8
	↓	6	3	9	15
	2	1	3	5	23

$\boxed{g(3) = 23}$

12.) $f(x) = x^5 - 2x^3 + 15$ when $x = 4$

$f(4) = (4)^5 - 2(4)^3 + 15$

$= 1024 - 128 + 15$

$\boxed{f(4) = 911}$

4	1	0	-2	0	0	15
	↓	4	16	56	224	896
	1	4	14	56	224	911

$\boxed{f(4) = 911}$

Describe the end behavior of the graph of the polynomial function by completing the statements. (Hint: Sketch a general picture of the graph to help).

13.) $f(x) = -8x^{10} + 21x^3$ D: even LC: −

$f(x) \to \underline{-\infty}$ as $x \to -\infty$

$f(x) \to \underline{-\infty}$ as $x \to +\infty$

↙ ↘

14.) $f(x) = 12x^{15} - 2x^{14} + 8x^7 + 99$ D: odd LC: +

$f(x) \to \underline{-\infty}$ as $x \to -\infty$

$f(x) \to \underline{+\infty}$ as $x \to +\infty$

↗ ↙

15.) $f(x) = -x^5 + 1$ D odd LC: −

$f(x) \to \underline{+\infty}$ as $x \to -\infty$

$f(x) \to \underline{-\infty}$ as $x \to +\infty$

↖ ↘

16.) $f(x) = \frac{1}{2}x^6 + 8x^3 - 11x^2 + 19$ D: even LC: +

$f(x) \to \underline{+\infty}$ as $x \to -\infty$

$f(x) \to \underline{+\infty}$ as $x \to +\infty$

↑ ↗

Perform the indicated operation.

17.) $(5x^3 - x + 3) + (x^3 - 9x^2 + 4x)$

$5x^3 + x^3 - 9x^2 - x + 4x + 3$

$\boxed{6x^3 - 9x^2 + 3x + 3}$

18.) $(x^3 + 4x^2 - 5x) - (4x^3 + x^2 - 7)$

$x^3 - 4x^3 + 4x^2 - x^2 - 5x + 7$

$\boxed{-3x^3 + 3x^2 - 5x + 7}$

19.) $(x-6)(5x^2+x-8)$

$x(5x^2+x-8)-6(5x^2+x-8)$

$5x^3+x^2-8x-30x^2-6x+48$

$\boxed{5x^3-29x^2-14x+48}$

20.) $[(x-4)(x+7)](5x-1)$

$(x^2+7x-4x-28)(5x-1)$

$(5x-1)(x^2+3x-28)$

$5x(x^2+3x-28)-1(x^2+3x-28)$

$5x^3+15x^2-140x-x^2-3x+28$

$\boxed{5x^3+14x^2-143x+28}$

Factor the polynomial completely.

21.) $64x^3-8$

$(2x)^3 \quad (1)^3$

$8(8x^3-1)$

$\boxed{8(2x-1)(4x^2+2x+1)}$

22.) $2x^5-12x^3+10x$

$2x(x^4-6x^2+5)$

$2x(x^2-5)(x^2-1)$

$\boxed{2x(x^2-5)(x+1)(x-1)}$

23.) $2x^3-7x^2-8x+28$

$x^2(2x-7)-4(2x-7)$

$(2x-7)(x^2-4)$

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

$(3g)^3 \quad (7)^3$

24.) $27g^3+343$

$\boxed{(3g+7)(9g^2-21g+49)}$

Find the real-number solutions of the equation (Start by factoring).

$8 \cdot -21 = -168$

$-22 = -28+6$

$(4g^2)^2 \quad (25)^2$

25.) $16g^4-625=0$

$(4g^2+25)(4g^2-25)=0$

$(4g^2+25)(2g+5)(2g-5)=0$

$4g^2+25=0$

$4g^2=-25$

↓

no real solutions

$2g+5=0$

$\boxed{g=-5/2}$

$2g-5=0$

$\boxed{g=5/2}$

26.) $16x^3-44x^2-42x=0$

$2x(8x^2-22x-21)=0$

$2x(8x^2-28x+6x-21)=0$

$2x(4x(2x-7)+3(2x-7))=0$

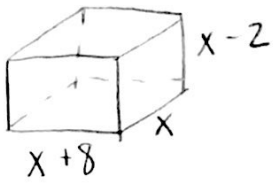
$2x(2x-7)(4x+3)=0$

$2x=0$ $\quad 2x-7=0$ $\quad 4x+3=0$

$\boxed{x=0}$ $\quad \boxed{x=7/2}$ $\quad \boxed{x=-3/4}$

27.) A shipping box is shaped like a rectangular prism. It has a total volume of 96 cubic inches. The height is two inches less than the width and the length is eight inches longer than the width.

a.) Write a polynomial equation in standard form that represents the volume of the box.



$V = x(x+8)(x-2)$

$= x(x^2 - 2x + 8x - 16)$

$= x(x^2 + 6x - 16)$

$\boxed{V = x^3 + 6x^2 - 16x}$

b.) Solve the polynomial equation from part a. What are the dimensions of the box?

$x^3 + 6x^2 - 16x = 96$

$x^3 + 6x^2 - 16x - 96 = 0$

$x^2(x+6) - 16(x+6) = 0$

$(x+6)(x^2 - 16) = 0$

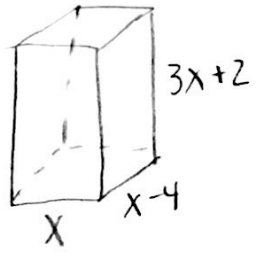
$(x+6)(x+4)(x-4) = 0$

$x+6=0 \quad x+4=0 \quad x-4=0$

$x=-6 \quad x=-4 \quad \boxed{x=4}$

h: 2 in
w: 4 in
ℓ: 12 in

28.) You have 240 cubic inches of clay with which to make a sculpture shaped like a rectangular prism. You want the width to be 4 inches less than the length and the height to be 2 inches more than 3 times the length. What should the dimensions of the box be?



$x(x-4)(3x+2) = 240$

$x(3x^2 + 2x - 12x + 8) = 240$

$x(3x^2 - 10x + 8) = 240$

$3x^3 - 10x^2 + 8x = 240$

$3x^3 - 10x^2 + 8x - 240 = 0$

$x^2(3x-10) + 8(x-30) = 0$

??

we need an additional method to factor this!