Academic Algebra II
Chapter 2 Review

Name: KEY
Date:

SHOW ALL WORK!

Evaluate the expression.

1. $4^{-6} \bullet 4^{-1}$

$4^{-7} = \boxed{\frac{1}{4^7}}$

2. $\left(\frac{2}{3}\right)^3$

$\boxed{\frac{2^3}{3^3} \text{ or } \frac{8}{27}}$

3. $(5^{-2})^2$

$5^{-4} = \boxed{\frac{1}{5^4}}$

Write the answer in scientific notation.

4. $(3.4 \times 10^{-1})(3.1 \times 10^{-2})$

10.54×10^{-3}

$\boxed{1.054 \times 10^{-2}}$

5. $\dfrac{8.4 \times 10^{-6}}{2.4 \times 10^{9}}$

$\boxed{3.5 \times 10^{-15}}$

Simplify the expression

6. $\dfrac{y^4}{y^{-7}}$

$y^{(4--7)} = \boxed{y^{11}}$

7. $(2m^3n^{-1})(8m^4n^{-2})$

$16m^{(3+4)}n^{(-1+-2)}$

$16m^7n^{-3}$

$\boxed{\frac{16m^7}{n^3}}$

8. $\dfrac{8e^{-4}f^{-2}}{18ef^{-5}}$

$\dfrac{4e^{(-4-1)}f^{(-2--5)}}{9}$

$\dfrac{4e^{-5}f^3}{9} = \boxed{\frac{4f^3}{9e^5}}$

Decide whether the function is a polynomial function. If it is, write the function in standard form and state the degree, type, and leading coefficient.

9. $g(x) = \pi - 4x^2 + \dfrac{2}{x}$

Not a ~~yes~~, polynomial function

(negative exponent)

$\frac{2}{x} = 2x^{-1}$

10. $h(x) = x^4 - x^3$

yes, polynomial function

Stand. form: $h(x) = x^4 - x^3$

degree: 4

type: quartic

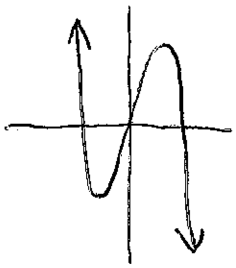
lead. coeff.: 1

Describe the end behavior of the graph of the polynomial function by completing these statements: $f(x) \to$ __?__ as $x \to -\infty$ and $f(x) \to$ __?__ as $\to +\infty$. **AND JUSTIFY.**

11. $f(x) = -x^7 + 10x$

As $x \to -\infty$
$f(x) \to \infty$

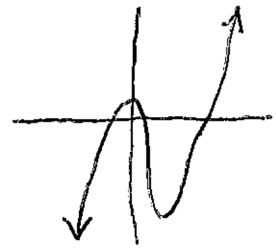
As $x \to \infty$
$f(x) \to -\infty$



12. $f(x) = 2x^5 - 7x^2 - 4x$

As $x \to -\infty$
$f(x) \to -\infty$

As $x \to \infty$
$f(x) \to \infty$



Find the sum or difference.

13. $(2y^2 - 5y + 1) + (y^2 - y - 4)$

$(2y^2 + y^2) + (-5y - y) + (1 - 4)$

$\boxed{3y^2 - 6y - 3}$

14. $(10v^4 - 2v^2 + 6v^3 - 7) - (9 - v + 2v^4)$

$10v^4 - 2v^2 + 6v^3 - 7 - 9 + v - 2v^4$

$(10v^4 - 2v^4) + (6v^3) + (-2v^2) + (v) + (-7 - 9)$

$\boxed{8v^4 + 6v^3 - 2v^2 + v - 16}$

Find the product.

15. $(x - 3)^2$

$(x-3)(x-3)$

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

16. $(n + 5)(2n^2 - n - 7)$

$2n^3 - n^2 - 7n$
$+10n^2 - 5n - 35$

$\boxed{2n^3 + 9n^2 - 12n - 35}$

17. $(2f + 1)^3$

$(2f+1)(2f+1)(2f+1)$

$(4f^2 + 2f + 2f + 1)(2f+1)$

$(4f^2 + 4f + 1)(2f+1)$

$8f^3 + 4f^2$
$+8f^2 + 4f$
$+2f + 1$
$8f^3 + 12f^2 + 6f + 1$

$\boxed{8f^3 + 12f^2 + 6f + 1}$

Factor the polynomial completely using any method.

18. $x^3 + 125$

sum of cubes
$a = x \quad b = 5$

$\boxed{(x+5)(x^2 - 5x + 25)}$

19. $(x^3 + 6x^2) + (7x + 42)$

$x^2(x+6) + 7(x+6)$ factoring by grouping

$\boxed{(x^2+7)(x+6)}$

20. $c^4 - 81$

diff. of squares

$(c^2+9)(c^2-9)$

$\boxed{(c^2+9)(c+3)(c-3)}$

Find all the zeros of the polynomial function.

degree 4 = 4 solutions

21. $h(x) = 2x^4 + x^3 + x^2 + x - 1$

① Poss. Rat. zeroes

C: -1
factors: 1
LC: 2
factors: 1, 2

$\frac{C}{LC} = \pm\frac{1}{1}, \pm\frac{1}{2}$

② Check calculator table for real zeroes

$x = -1, \frac{1}{2}$

③
$$\begin{array}{r|rrrrr} -1 & 2 & 1 & 1 & 1 & -1 \\ & \downarrow & -2 & 1 & -2 & 1 \\ \hline \end{array}$$

④
$$\begin{array}{r|rrrrr} \frac{1}{2} & 2 & -1 & 2 & -1 & \boxed{0} \\ & \downarrow & 1 & 0 & 1 & \\ \hline & 2 & 0 & 2 & \boxed{0} & \end{array}$$

⑤ $2x^2 + 0x + 2 = 0$

$2x^2 + 2 = 0$
$\quad -2 \quad -2$

$\frac{2x^2}{2} = \frac{-2}{2}$ $\quad \sqrt{x^2} = \sqrt{-1}$ $\quad x = \pm i$

⑥ $\boxed{\text{Zeroes} = -1, \frac{1}{2}, \pm i}$

degree 3 = 3 solutions

22. $h(x) = x^3 - 3x^2 - x + 3$

① Poss. Rat. Zeroes

C: 3
Factors: 1, 3
LC: 1
Factors: 1

$\frac{C}{LC} = \pm\frac{1}{1}, \pm\frac{3}{1}$

② Calculator table for real zeroes

$\boxed{x = -1, 1, 3}$

3 solutions = done!

Determine the possible numbers of positive real zeros, negative real zeros, and imaginary zeros for the function.

23. $g(x) = x^4 + 3x^2 - 10x + 16$

Positive Zeroes (2 sign changes)
2
0

Negative zeroes
0

$g(-x) = (-x)^4 + 3(-x)^2 - 10(-x) + 16$
$g(-x) = x^4 + 3x^2 + 10x + 16$
(0 sign changes)

Imaginary zeroes
2
4

degree = 4 → 4 solutions/zeroes
$2 + 0 = 2 \quad 4 - 2 = 2$
$0 + 0 = 0 \quad 4 - 0 = 4$

24. $f(x) = x^6 + 2x^5 - 12x^4 - x^3 + 7x^2 + 5x - 16$

Positive Zeroes (3 sign changes)
3
1

Negative Zeroes
3
1

$f(-x) = (-x)^6 + 2(-x)^5 - 12(-x)^4 - (-x)^3 + 7(-x)^2 + 5(-x) - 16$
$f(-x) = x^6 - 2x^5 - 12x^4 + x^3 + 7x^2 - 5x - 16$
(3 sign changes)

Imaginary
0
2
4

degree = 6 → 6 zeroes
$3 + 3 = 6 \quad 6 - 6 = 0$
$3 + 1 = 4 \quad 6 - 4 = 2$
$1 + 3 = 4 \quad 6 - 4 = 2$
$1 + 1 = 2 \quad 6 - 2 = 4$

Write a polynomial function *f* of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros.

25. $4+i, 0$

$(x-(4+i))(x-(4-i))(x)$

$(x-4-i)(x-4+i)(x)$

$(x^2-4x+\cancel{ix}-4x+16-\cancel{4i}-\cancel{ix}+\cancel{4i}-i^2)(x)$

$(x^2-4x-4x+16-(-1))(x)$

$(x^2-8x+17)x$

$f(x)=\boxed{x^3-8x^2+17x}$

26. $-3, 0, 1$

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

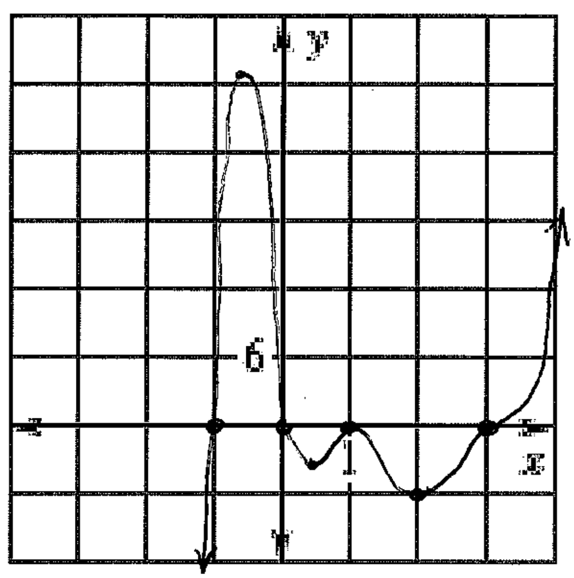
$(x^2+3x)(x-1)$

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

$\boxed{f(x)=x^3+2x^2-3x}$

Use a graphing calculator to graph the function. (Be sure to label all *x*-intercepts, local maximums, and local minimums) (

7. 27. $g(x) = x(x+1)(x-1)^2(x-3)^3$



x-intercepts: (0,0) (-1,0) (1,0) (3,0)

local max: (1,0) (-.7, 30.7)

local min: (.3, -3.8) (2, -6)