Name: _____ Date:_____ Period: _____

Unit 1A Review – Polynomial and Rational Functions

Reviews do NOT cover all material from the lessons but will hopefully remind you of key points. To be prepared, you must study all packets for lessons 1.1 – 1.6.

1. For the function $s(t)$, s is the number of people swimming at the local pool and t is the temperature measured in Fahrenheit. Identify the dependent and independent variables.

    Dep:

    Indep:

2. Let the function f be increasing or decreasing, but not both. State whether the function is increasing or decreasing on the interval $9 < x < 17$ and justify your answer.

x	9	11	13	15	17
$f(x)$	8	12	15	17	18

3. Use the graph to the right to answer the questions below.
    a. On what interval(s) is the graph concave up?

    b. On what interval(s) is the graph concave down?

    c. On what interval(s) is the graph increasing?

    d. On what interval(s) is the graph decreasing?

    e. Find the zeros of the function.

    f. Find the y-intercept of the function.
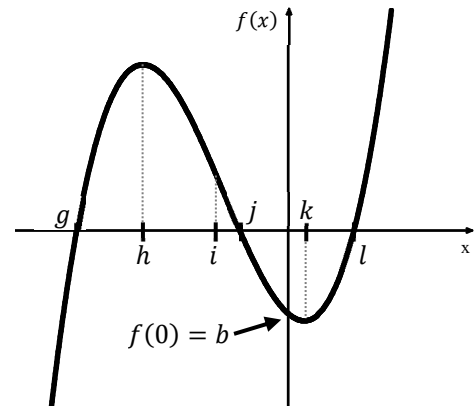
4. **Calculator active.** Find the average rate of change of the function $w(r) = \sqrt{1 - 4r}$ on the interval $-5 \le r \le -1$.

5. **Calculator active.** Using the information in the table below, find the average rate of change for each given interval. Include units.

t seconds	24	60	135	200
$s(t)$ miles	8	1.3	3.5	0.3

a. $135 \le t \le 200$

b. $24 \le t \le 135$

c. $24 \le t \le 200$

6. **Calculator active.** Estimate the rate of change of $f(x) = x^2 - x$ at $x = -1$

7. Mr. Gardener is decreasing the amount of water used on his lawn each month, and the height of his grass is decreasing. Does this scenario represent a positive or negative rate of change?

What is the average rate of change for each function on the given intervals?	
8. $y = 7 - 2x$ on $-4 \le x \le 1$	9. $y = 3x^2 - 2x + 1$ on $-1 \le x \le 2$

What is the rate of change of the average rates of change for each function over consecutive equal-length intervals?	
10. $y = 5x + 9$	11. $f(x) = 2x - 5x^2$.

12. The values of a function are given at selected x-values in the table below. The function's concavity does not change. Determine if the function is concave up or concave down. Justify your answer.

x	5	9	13	17	21
$g(x)$	45	20	0	-10	-14

Find the leading coefficient and the degree of each polynomial.

13. $f(x) = x^5 - 2x^2$

   L.C. _____   Degree: _____

14. $f(x) = 10 - 3x^2 + 7x^3 - 2x$

   L.C. _____   Degree: _____

Let $f(x)$ be a polynomial function with the given values. Are there any guaranteed extrema? If so, state where they occur.
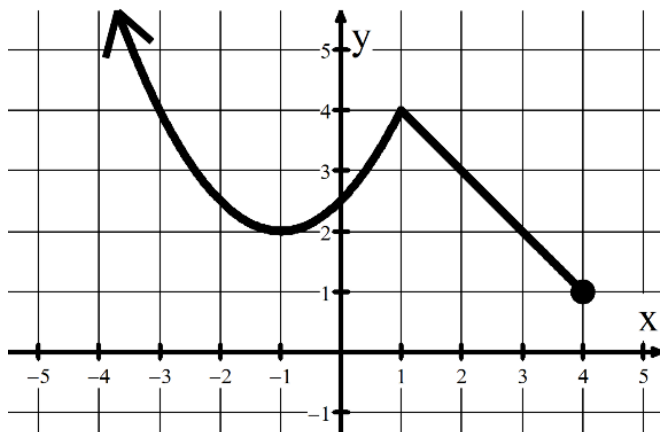
15. $f(0) = -3, f(4) = 0,$ and $f(7) = 0.$

16. $f(-7) = 0, f(-2) = 5, f(0) = 1,$ and $f(9) = 0.$

Is there a global maximum or minimum for each function?

17. $f(x) = -5x^6 + 6x^4 - 3x^3 + 1$

18. $f(x) = 2x^5 + x^2 - 6$

Find the following extrema. If there are none, cross it off and write NONE.

19. Absolute **min** of _____ when $x =$

20. Absolute **max** of _____ when $x =$

21. Relative **min**(s) at $x =$

22. Relative **max**(es) at $x =$

For each polynomial function, find the intervals for each condition.

23. $h(x) = x^2 - 8x + 15$. When is $h(x) \leq 0$?	24. $f(x) = -x^3 + 5x^2 + 24x$. When is $f(x) \geq 0$?

25. The degree of a polynomial is 7 with real zeros at $x = -8, x = 1$, and $x = 4$. $x = 1$ has a multiplicity of 3. How many non-real zeros does the polynomial have?
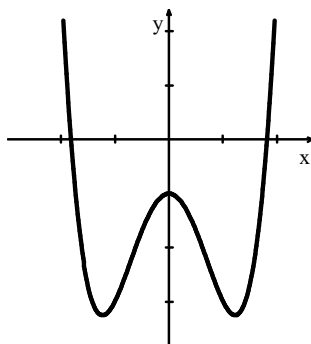
26. $5 - i$ is a non-real zero of a polynomial, find another zero.

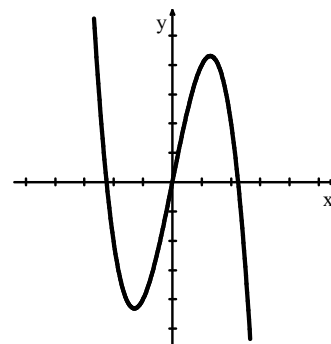27. Find the **degree** of the polynomial from the given input and output values.

Input	0	1	2	3	4	5	6	7
Output	2	-2	4	20	46	82	128	184

State whether the following graphs represent functions that are even, odd, or neither.

28.

29.

State if the following functions are even, odd, or neither.

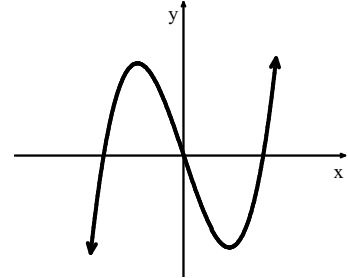|	
30. $f(x) = 4x^7 + 5x^3 - 2x$	31. $f(x) = 7 - 6x^8 - 3x^2$

Describe the end behavior of each function using limit notation.

32. $p(x) = -11x^7 - 6x^2 + 4x$	33. $p(x) = -7x^6 + 4x - 8$	34.

35. Sketch the graph of a polynomial function that could match statements $\lim\limits_{x \to -\infty} p(x) = \infty$ and $\lim\limits_{x \to \infty} p(x) = \infty$.