Worksheet A: (Topics 1.1 -1.6) Polynomial Review   Name:
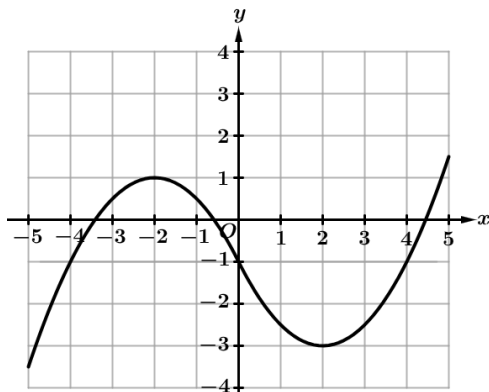
Directions: Read each question carefully. Determine the intervals for each of the following problems. Write your answers in interval notation.
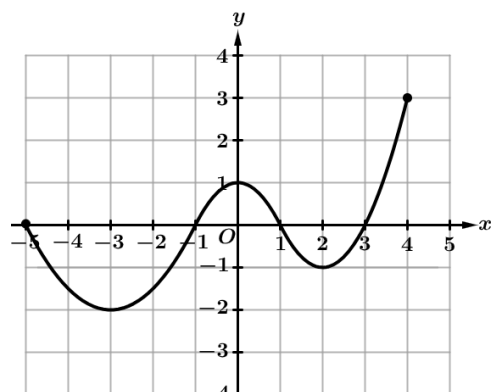
1.

Graph of $f(x)$

The graph of the polynomial function f is shown above, where $-5 \le x \le 5$. The function f has local extrema at $x = -2$ and $x = 2$, and the graph of f has a point of inflection at $x = 0$.

1a) On what intervals is f increasing?

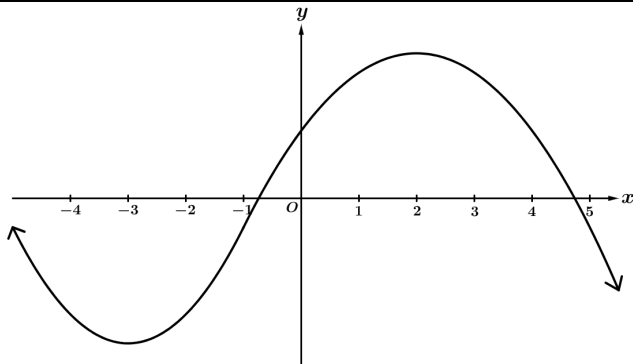1b) On what intervals is the graph of f concave down?

2.

Graph of $g(x)$

The graph of g is shown above, where $-5 \le x \le 4$. The graph of g has points of inflection at $x = -1$ and $x = 1$.

2a) On what intervals is g decreasing?

2b) On what intervals is the graph of g concave up?

3.

Graph of $h(x)$

The graph of h, shown above, has relative extrema at $x = -3$ and $x = 2$, and a point of inflection at $x = -1$.

3a) On what intervals is h increasing and concave down?

3b) On what intervals is h decreasing and concave up?

3c) On what intervals is h decreasing at a decreasing rate?

3d) On what intervals is h increasing at an increasing rate?
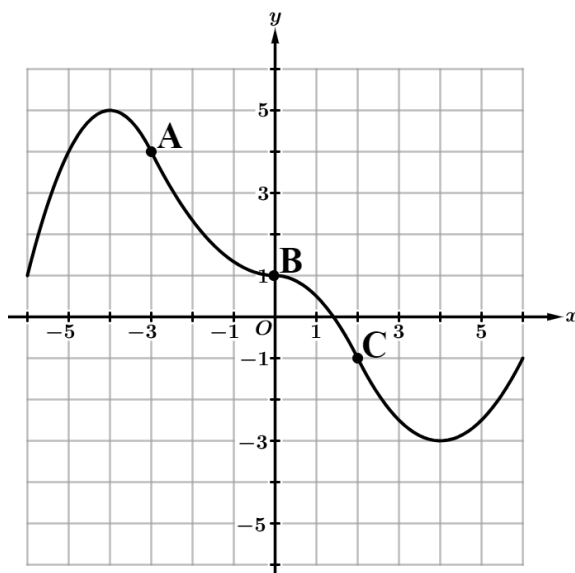
Graph of $k(x)$

The graph of k is shown above over the interval $-6 \le x \le 6$. The points labeled A, B, and C indicate points where the graph of k has a point of inflection.
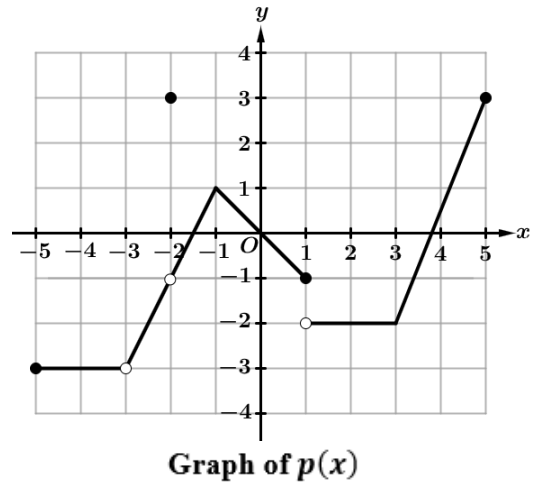
For 4 – 13, determine if each of the following statements is **TRUE** or **FALSE**.

4. _____ The rate of change of k is increasing over the interval $(4, 6)$.

5. _____ The rate of change of k is negative over the interval $(-4, 0)$.

6. _____ k is increasing at a decreasing rate over the interval $2 < x < 4$.

7. _____ The rate of change of k is positive and decreasing over the interval $-6 < x < -4$.

8. _____ The graph of k is concave down over the interval $-4 < x < 4$.

9. _____ k is increasing over the intervals $(-6, -4)$ and $(4, 6)$.

10. _____ k is negative and increasing over the interval $(4, 6)$.

11. _____ k is decreasing at a decreasing rate over the intervals $-3 < x < 0$ and $2 < x < 4$.

12. _____ k is positive and the graph of k is concave up over the interval $(-3, 0)$.

13. _____ k is positive and the rate of change of k is positive over the interval $(4, 6)$.

Worksheet A: Topics 1.1 – 1.6   Polynomial Review   Created by Bryan Passwater

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

$g(x) = \begin{cases} 4 - 2x, & \text{if } x < 3 \\ x^2 + 2, & \text{if } x \geq 3 \end{cases}$

x	-2	0	1	5
$k(x)$	8	-3	4	7

Graph of $p(x)$

The equations for the function f and the piecewise defined function g are given above. Selected values of the function k are shown in the table and the graph of p is given for the interval $-5 \leq x \leq 5$.

Directions: For 14 – 21, use the information about $f, g, k,$ and p to find the average rate of change over the given intervals.

14. Find the average rate of change of $f(x)$ over the interval $1 \leq x \leq 2$.

15. Find the average rate of change of $f(x)$ over the interval $[-2, 0]$.

16. Find the average rate of change of $g(x)$ over the interval $-1 \leq x \leq 4$.

17. Find the average rate of change of $g(x)$ over the interval $[0, 3]$.

18. Find the average rate of change of $g(x)$ over the interval $-4 \leq x \leq 2$.

19. Find the average rate of change of $k(x)$ over the interval $[-2, 1]$.

20. Find the average rate of change of $p(x)$ over the interval $-1 \leq x \leq 5$.

21. Find the average rate of change of $p(x)$ over the interval $[-2, 1]$.

Directions: For 22 – 27, determine if the following functions could be concave up, concave down, or neither.

22.

x	$f(x)$
1	3
2	4
3	6
4	9
5	15

23.

x	$g(x)$
0	−3
2	1
4	7
6	11
8	15

24.

x	$h(x)$
−3	−10
0	−3
3	2
6	4
9	5

25.

x	$k(x)$
0	−5
1	−3
2	0
3	6
4	11

26.

x	$p(x)$
0	64
1	32
2	16
3	8
4	4

27.

x	$m(x)$
0	0
10	−2
20	−4
30	−8
40	−16

Directions: For 28 – 31, determine the least possible degree of the following polynomials.

28.

x	$f(x)$
0	−3
1	−3
2	1
3	8
4	17
5	27

29.

x	$g(x)$
0	12
2	8
4	6
6	6
8	8
10	12

30.

x	$h(x)$
5	0
10	−5
15	−7
20	−6
25	−1
30	10

31.

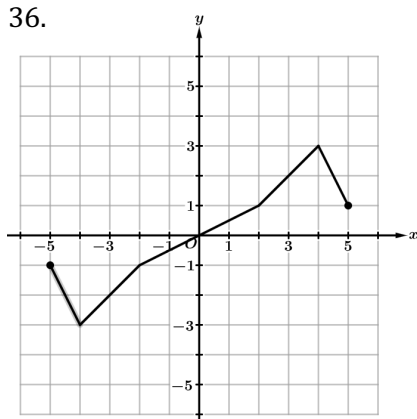| x	$k(x)$
0	0
1	1
4	4
9	9
16	16
25	25

Directions: For 32 – 38, determine if the following functions are even, odd, or neither.

33. $y = 2x^3 - 3x + 9$ 34. $f(x) = x^4 - 3$ 35. $g(x) = -6x^5 + 2x^3 - x$
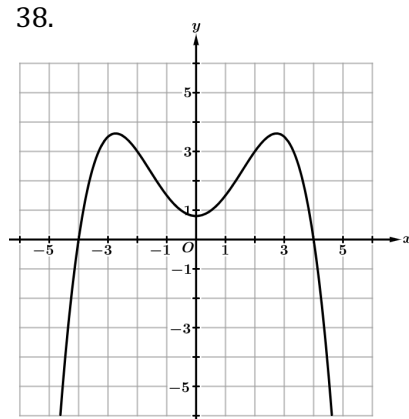
36.

Graph of $f(x)$

37.

Graph of $g(x)$

38.
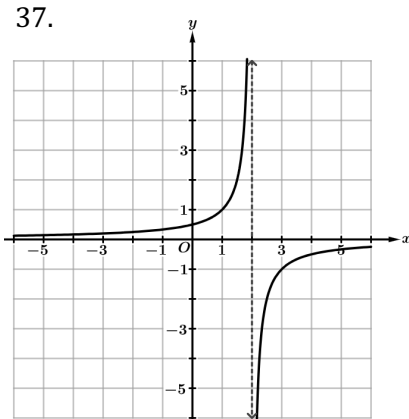
Graph of $h(x)$

Directions: The polynomial function k is **even** and the polynomial function p is **odd**. Selected values for the functions k and p are shown in the tables below. Use the information in the tables to answer the following problems.

x	$k(x)$
-3	8
-2	-6
1	4
3	a
6	-1

x	$p(x)$
-5	4
-4	-3
-3	2
2	7
b	3

39. Find the values of a and b in the tables above.

40. Find $k(2) + p(-2)$

41. Find $k(-1)$ and $p(3)$.

42. Find the average rate of change of $p(x)$ over the interval $-5 \le x \le 5$.