HAPC
Unit 1

Name: _____

1.4 Worksheet: Polynomial Functions and Rates of Change Hour:_____ Date: _____

Directions: For each of the following, determine if the given function is a polynomial. If the function is a polynomial, indicate the degree and leading coefficient.

1) $f(x)=5x^4-2x^3+7x+1$ Polynomial? (Yes) or No

If yes, leading coefficient: 5 degree: 4

2) $g(x)=3x^2-4^x+8$ Polynomial? ~~Yes~~ or (No)

If yes, leading coefficient: ~~3~~ degree: ~~2~~

3) $h(x)=x^5-4x^{-2}+5$ Polynomial? ~~Yes~~ or ~~No~~ No

If yes, leading coefficient: ~~1~~ degree: 5

4) $p(x)=\pi x^2-x^3+ex$ Polynomial? (Yes) or No

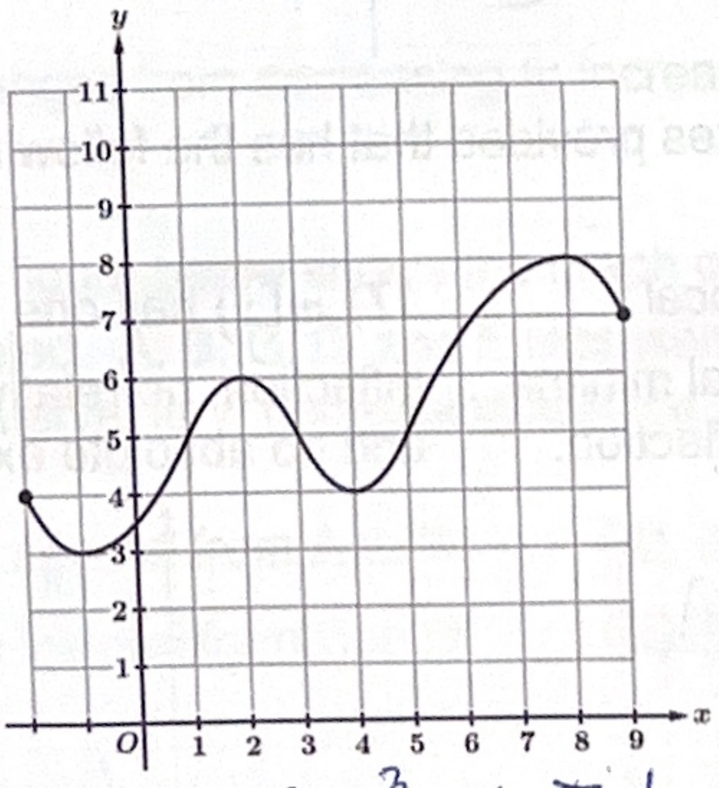
If yes, leading coefficient: -1 degree: 3

5) $m(x)=(4-3x^2)(x^2+x-5)$ Polynomial? (Yes) or No

$4x^2+4x-20-3x^4-3x^3+15x^2$ If yes, leading coefficient: -3 degree: 4

Directions: For each of the following polynomial graphs, determine the absolute minimum and absolute maximum. If the graph does not have a specific absolute extrema, write "none" in the appropriate space. Then determine any *x*-values where the graph has a local extrema. If the graph does not have a specific local extrema, write "none" in the appropriate space.

6)



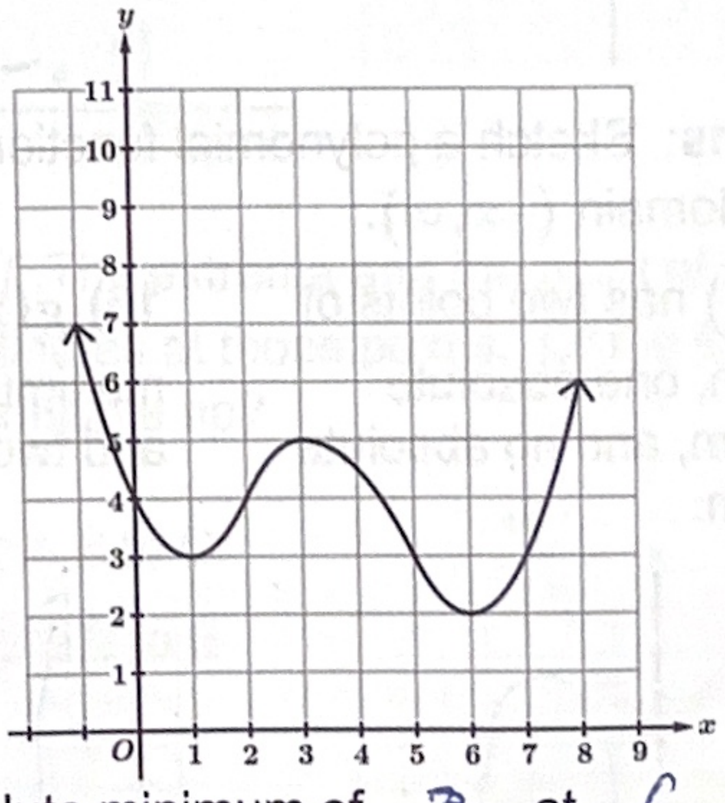
Absolute minimum of 3 at -1

Absolute maximum of 8 at 8

Relative minimums at -1, 4, 9

Relative maximums at -2, 2, 8

7)



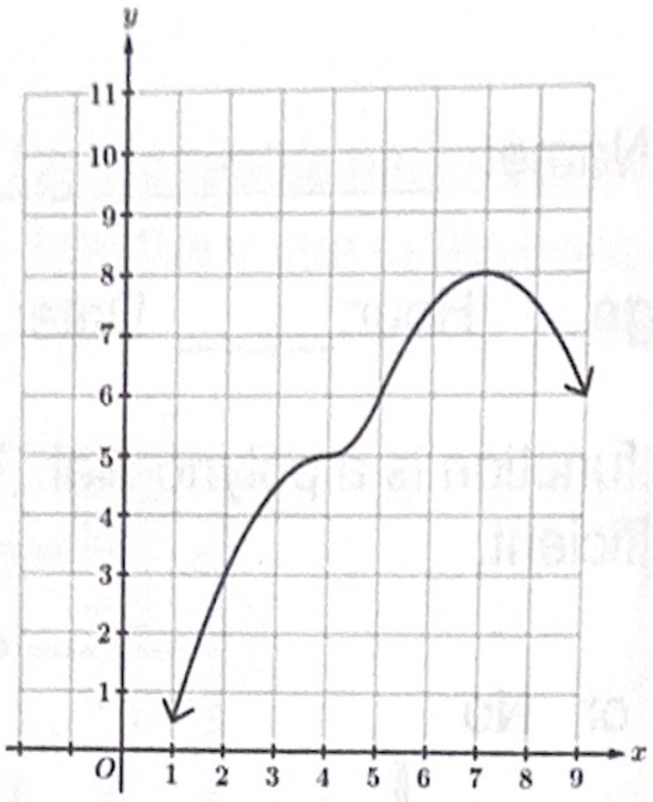
Absolute minimum of ~~3~~ 2 at 6

Absolute maximum of ~~None~~ at N/A

Relative minimums at 1, 6

Relative maximums at 3

8)



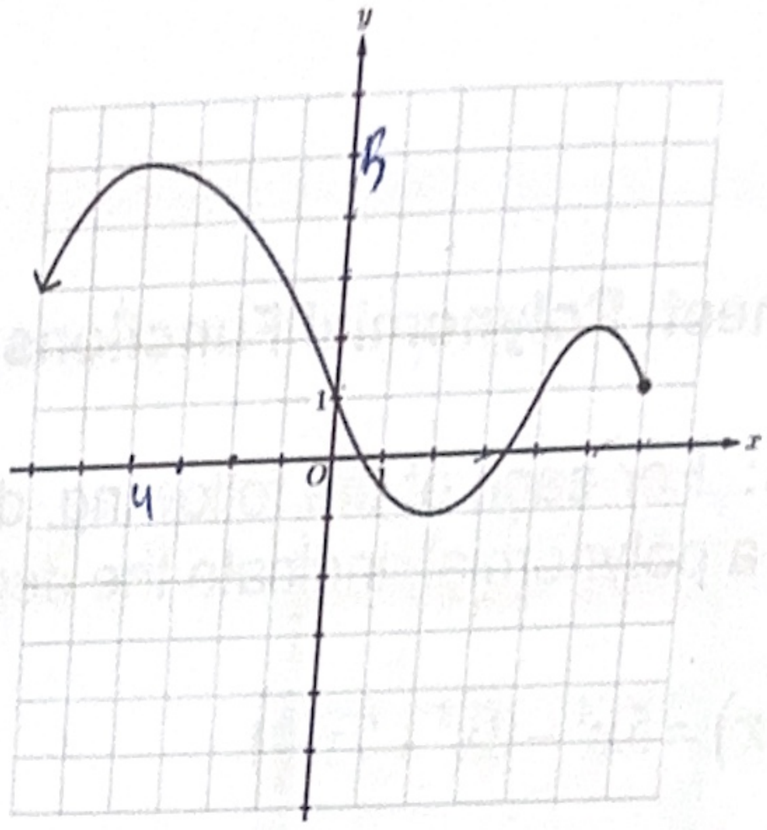
Absolute minimum of ____ at ____

Absolute maximum of 8 at 7

Relative minimums at ____

Relative maximums at 7

9)



Absolute minimum of ____ at ____

Absolute maximum of 5 at 4

Relative minimums at 2, 6

Relative maximums at 4, 5

Directions: For each of the following, determine if the given polynomial must have a global minimum, global maximum, or neither. Explain your reasoning.

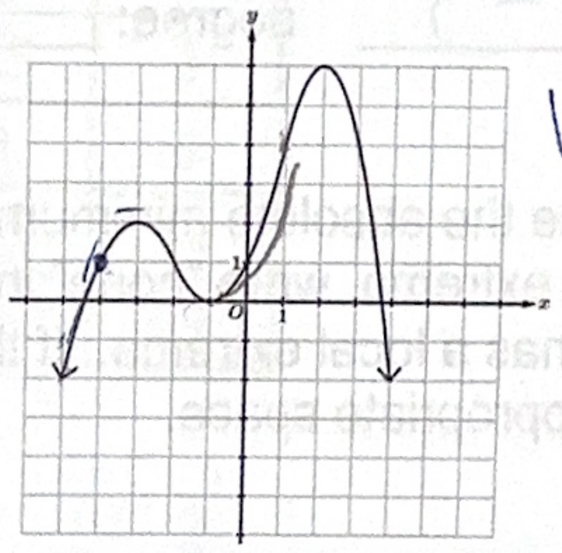
10) $f(x)=x^4-5x^3+x+6$ Global min

11) $y=-2x^3-x^2+8x$ neither

12) $g(x)=-x^6+x^3+4x^2+1$ Global ma

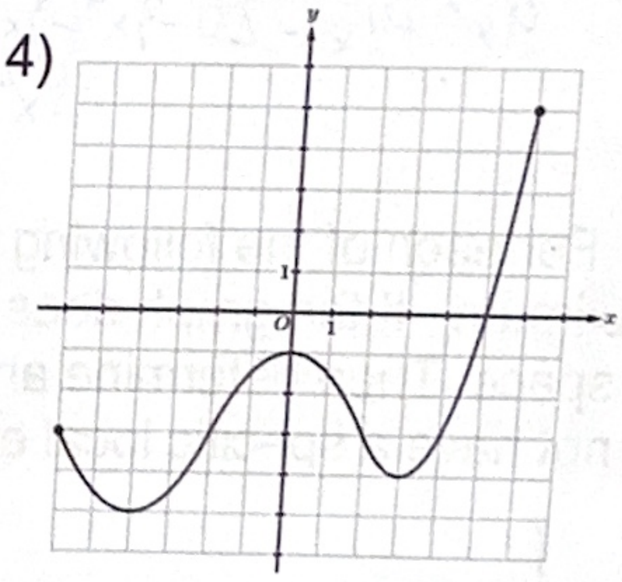
Directions: For the following polynomial graphs, determine (estimate) any x-values where the function has a point of inflection.

13)



x=-2,1

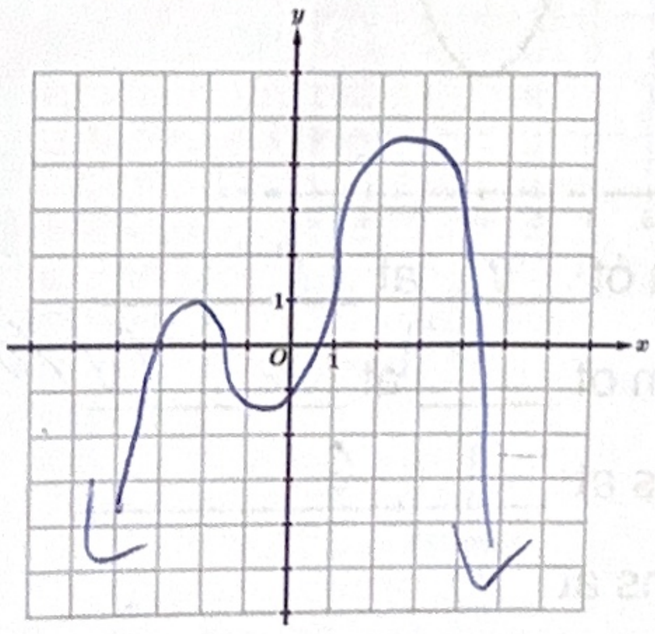
14)



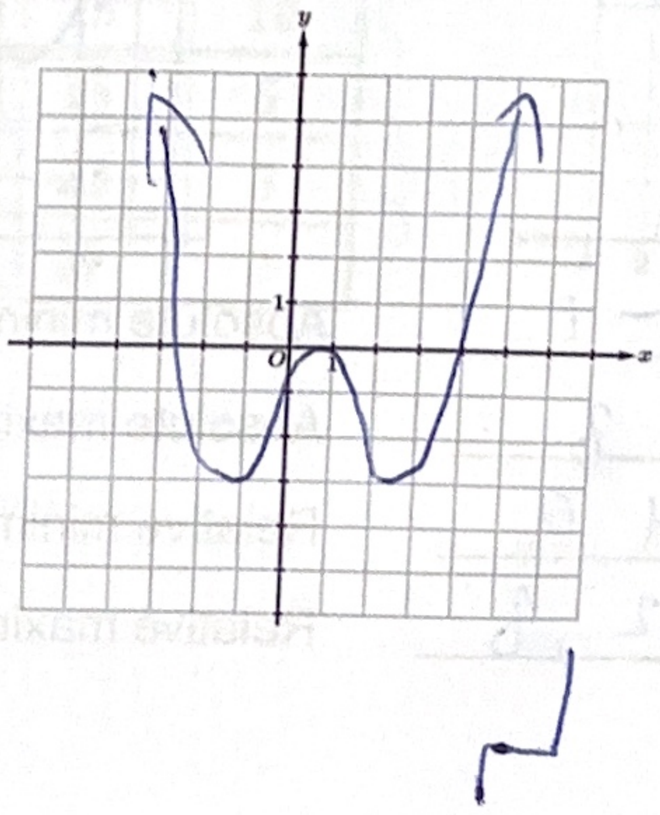
x=-2,1

Directions: Sketch a polynomial function on each axes provided that has the following properties and the domain $(-\infty,\infty)$.

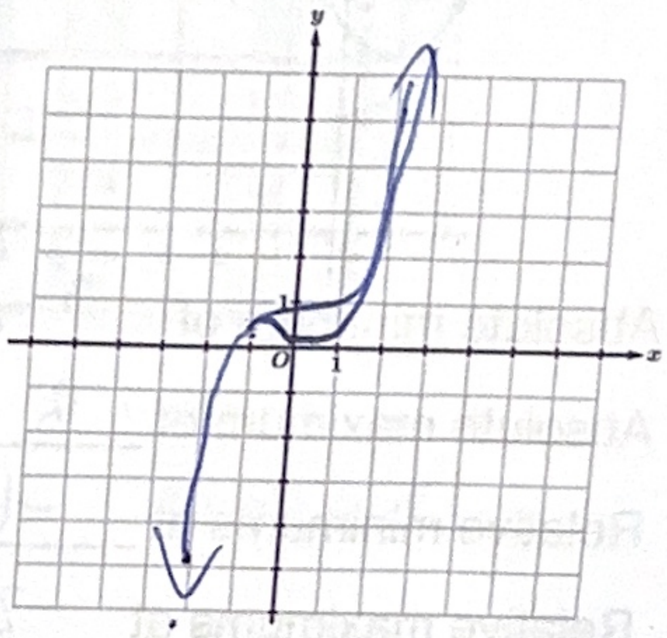
15) $f(x)$ has two points of inflection, one absolute maximum, and no absolute minimum.



16) $g(x)$ has one local maximum, two global minima, and two points of inflection.



17) $m(x)$ has one point of inflection, no relative extrema, and no absolute extrema.



Directions: The graph of $h(x)$ is shown below on the interval $-1 \le x \le 7$. Find the open intervals where the rate of change of $h(x)$ has the following properties.

18) The rate of change of $h(x)$ is positive and decreasing

(-4, 1)

19) The rate of change of $h(x)$ is negative and decreasing

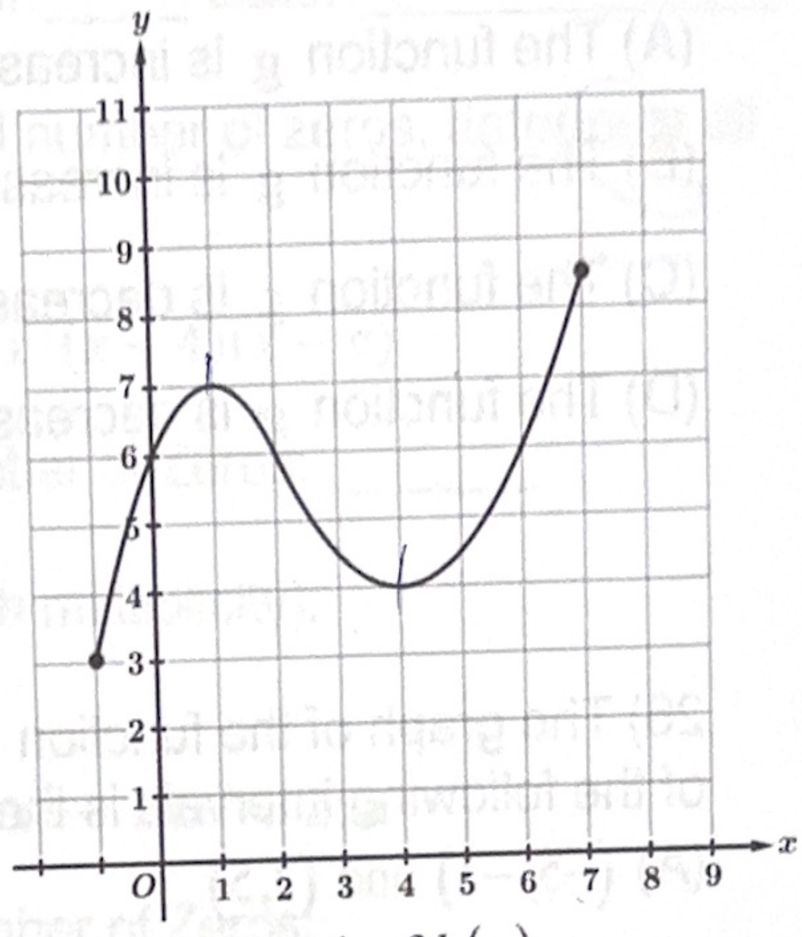
(1, 2.5)

20) The rate of change of $h(x)$ is positive and increasing

(4, 7)

21) The rate of change of $h(x)$ is negative and increasing

(2.5, 4)



Graph of $h(x)$

Directions: For #22 and #23, use your graphing calculator to graph each of the following functions. Then, use the calculator to answer the following questions.

22) Let $f(x) = 2.638x^3 - 8.12x - 6.59$ where $-3 < x < 3$.

f has a relative minimum of 12.07

f has a relative maximum of -1.11

f changes from increasing to decreasing at $x =$ -1.01

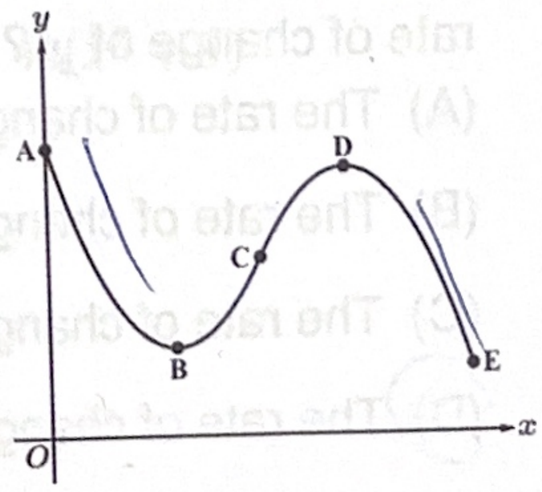
23) Let $h(x) = -6.58x^3 + 3.24x^2 + 1.59x - 6.42$ where $-1 < x < 1$.

h has a relative minimum at $x =$ -.16

h has a relative maximum at $x =$ .49

h changes from decreasing to increasing at $x =$ -.1

24) The figure below shows the graph of a function f. The extrema and the point of inflection of f are labeled. A, B, C, D, and E represent the x-coordinates at those points. Of the following, on which interval is f decreasing and the graph of f concave up?



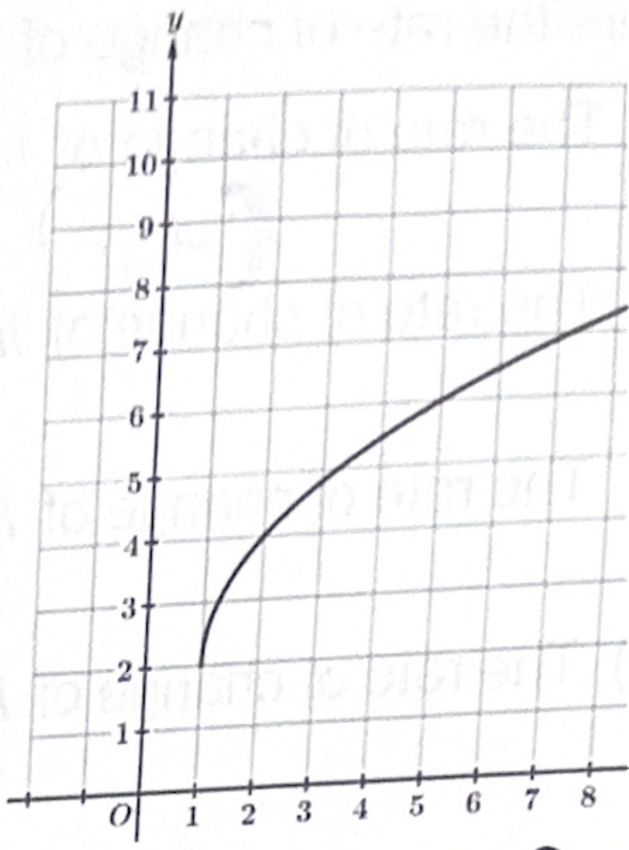
(A) the interval from A to B

(B) the interval from B to C

(C) the interval from C to D

(D) the interval from D to E

25) The graph of the function g is shown in the figure below. Which of the following best describes the function g over the interval $1 < x < 9$.



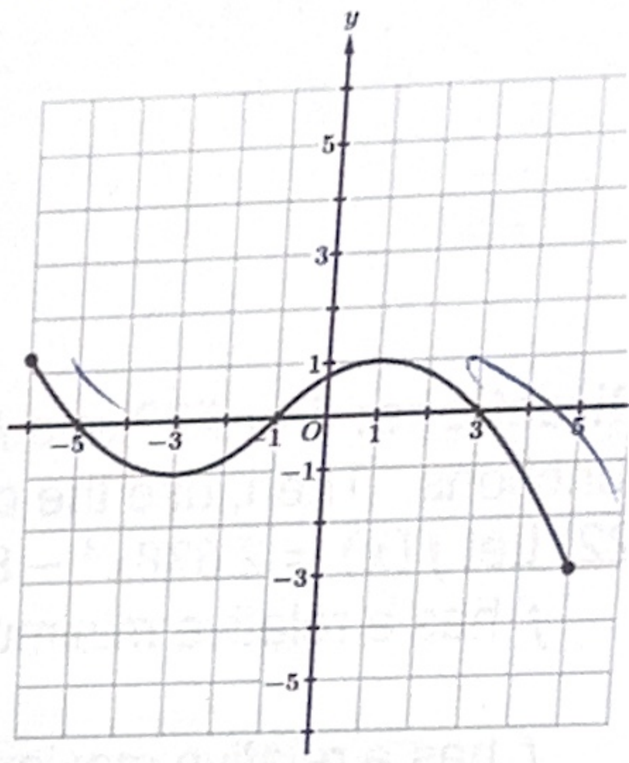
(A) The function g is increasing at an increasing rate.

(B) The function g is increasing at a decreasing rate.

(C) The function g is decreasing at an increasing rate.

(D) The function g is decreasing at a decreasing rate.

26) The graph of the function h is shown in the figure above on the interval $-6 \le x \le 5$. On which of the following intervals is the rate of change of h negative?



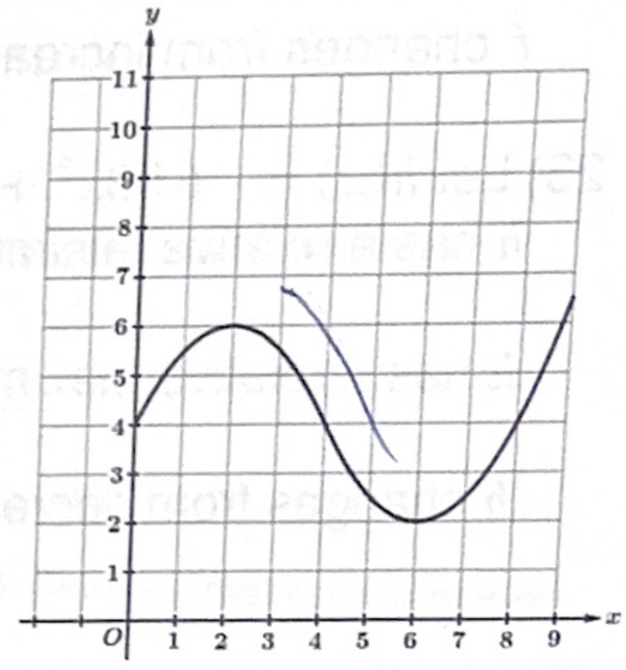
(A) $(-5,-1)$ and $(3,5)$

(B) $(-1,5)$

(C) $(1,5)$ only

(D) $(-6,-3)$ and $(1,5)$

27) The graph of a function k is shown in the figure for $0 \le x \le 9$. What are all the intervals of on which the rate of change of k is negative and decreasing?



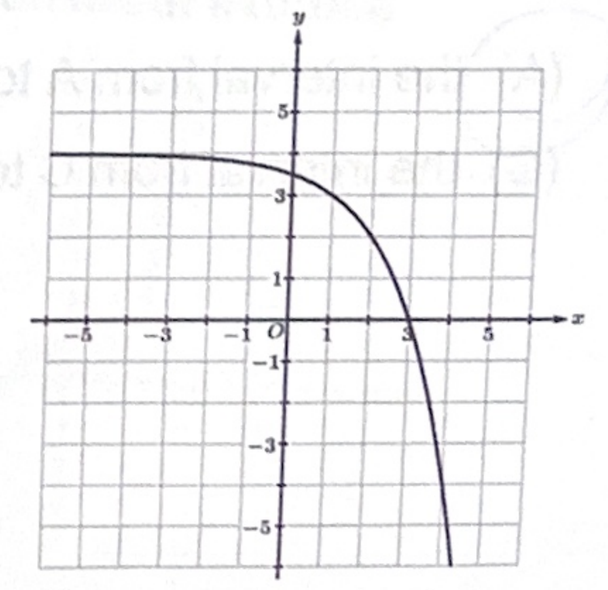
(A) $(2,6)$

(B) $(0,4)$

(C) $(2,4)$

(D) $(4,6)$

28) The graph of a function p is shown in the figure. Which of the following best describes the rate of change of p?



(A) The rate of change of p is positive and increasing.

(B) The rate of change of p is positive and decreasing.

(C) The rate of change of p is negative and increasing.

(D) The rate of change of p is negative and decreasing.