

Name: _____ Date: _____

Unit 1A CA – Polynomial and Rational Functions

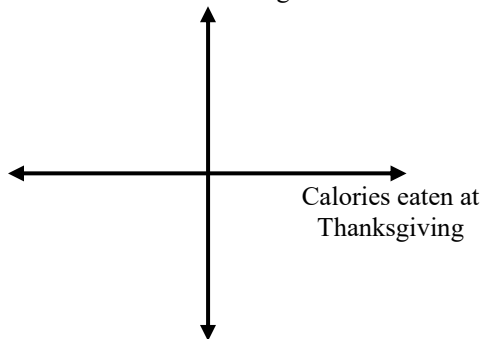
For each function, identify what the dependent and independent variables represent.

1. $r(c)$ is a function where c is the number of coyotes and r is the number of rabbits on the property.

Dep:

Indep:

2. Mr. Brust's weight



Dep:

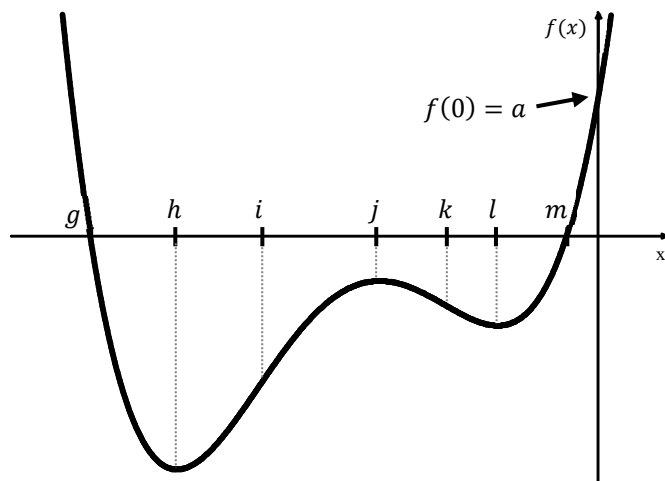
Indep:

3. Let the function f be increasing or decreasing, but not both. State whether the function is increasing or decreasing on the given interval and justify your answer.

x	15	30	50	75	110
$f(x)$	43	40	35	25	12

4.

- On what interval(s) is the graph concave up?
- On what interval(s) is the graph concave down?
- On what interval(s) is the graph increasing?
- On what interval(s) is the graph decreasing?
- Find the zeros of the function.
- Find the y -intercept of the function.



5. **Calculator active.** Find the average rate of change of the function $h(t) = t + 3^t$ on the interval $\frac{1}{2} \leq x \leq 1$.

6. Using the information in the table below, find the average rate of change for each interval.

t weeks	2	4	6	8
$B(t)$ wild boar	2	12	17	20

a. $2 \leq t \leq 8$

b. $6 \leq t \leq 8$

c. $2 \leq t \leq 6$

7. **Calculator active.** Estimate the rate of change of $f(x) = \frac{1}{x}$ at $x = 2$.

8. Increasing the number of cigarettes someone smokes increases their chance of lung cancer. 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?

9. $y = 3x - 6$ on $2 \leq x \leq 5$

10. $y = -x^2 + 3x + 4$ on $-2 \leq x \leq 1$

What is the rate of change of the average rates of change for each function over consecutive equal-length intervals?

11. $y = 7 - 3x$

12. $f(x) = 2x^2 + 3x - 6$.

13. 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	6	8	10	12	14
$g(x)$	8	6	0	-14	-34

Find the leading coefficient and the degree of each polynomial.

14. $f(x) = 4x^2 - 3$

L.C. _____ Degree: _____

15. $f(x) = -8x^3 + 5 + 9x^4$

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.

16. $f(-13) = 0, f(0) = 5$, and $f(2) = 3$.

17. $f(-1) = 0, f(0) = -8, f(4) = -3$, and $f(6) = 0$.

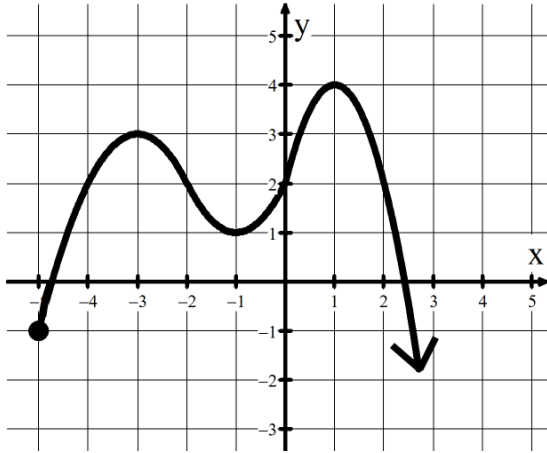
Is there a global maximum or minimum for each function?

18. $f(x) = -2x^7 + 1$

19. $f(x) = 3x^4 - 4x^3 - 2$

20. $f(x) = -2x^6 + 7x^5 - x^3 + x$

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



21. Absolute **min** of _____ when $x =$
22. Absolute **max** of _____ when $x =$
23. Relative **min**(s) at $x =$
24. Relative **max**(es) at $x =$

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

25. $f(x) = -x^2 - 4x + 45$. When is $f(x) \geq 0$?

26. $g(x) = (x + 5)^2(x - 1)^3(x - 6)$. When is $g(x) \geq 0$?

For each polynomial, the degree is listed along with all of its real zeros. Find the number of **NON-REAL** zeros the polynomial has.

27. The degree of a polynomial is 5 with real zeros at $x = -3, x = 0$, and $x = 2$. $x = 2$ has a multiplicity of 3.

28. The degree of a polynomial is 10 with real zeros at $x = -5, x = -2$, and $x = 11$. $x = 11$ has a multiplicity of 4.

Given one non-real zero of a polynomial, find another zero.

29. $9 + 2i$

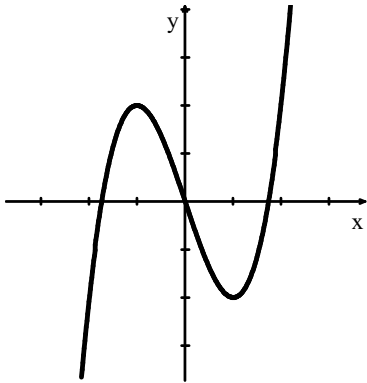
30. $-8 - i$

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

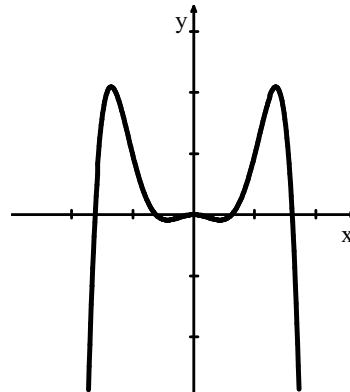
Input	0	1	2	3	4	5	6	7
Output	100	107	118	115	80	-5	-158	-397

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

32.



33.



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

34. $f(x) = x^4 + x + 1$

35. $f(x) = 6x^5 - 2x^3 + x$

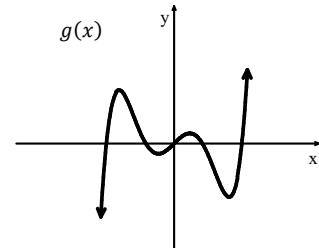
36. $f(x) = 3 + 5x^6 - 3x^2$

Describe the end behavior of each function using limit notation.

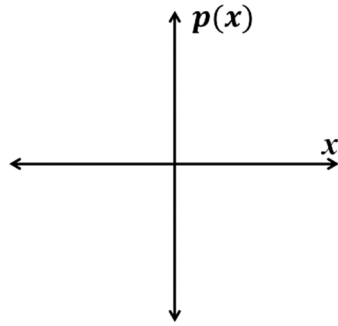
37. $f(x) = 7x^4 - 12$

38. $p(x) = -8x^{13} - 6x^4 + x$

39.



40. Sketch the graph of a polynomial function that could match statements $\lim_{x \rightarrow -\infty} p(x) = -\infty$ and $\lim_{x \rightarrow \infty} p(x) = -\infty$.



Answers to Unit 1A Corrective Assignment

1. Dependent: Number of rabbits. Independent: Number of coyotes.		2. Dependent: Mr. Brust's weight. Independent: Calories eaten at Thanksgiving.	
3. f is decreasing on the interval $15 < x < 110$ because for all a and b in the interval, if $a < b$, then $f(a) > f(b)$.		4a. $x < i$ and $x > k$	4b. $i < x < k$
4c. $h < x < j$ and $x > l$	4d. $x < h$ and $j < x < l$	4e. $x = g$ and $x = m$	4f. $y = a$
5. 3.5358	6a. 3 wild boar per week	6b. 1.5 wild boar per week	6c. 3.75 wild boar per week
7. ≈ -0.25	8. positive	9. 3	10. 4
			11. 0
			12. 4
13. Concave down because the rate of change is decreasing over equal-length input-value intervals.		14a. 4	14b. 2
		15a. 9	15b. 4
16. No guarantee.		17. Yes, on $-1 \leq x \leq 6$.	
		18. none	19. min
			20. max
21. none		22. max of 4 when $x = 1$	
		23. -5 and -1	
		24. -3 and 1	
25. $[-9, 5]$	26. $(-\infty, 1] \cup [6, \infty)$	27. 0	28. 4
		29. $9 - 2i$	30. $-8 + i$
31. 3	32. odd	33. even	34. Neither
		35. Odd, $f(-x) = -f(x)$	
36. Even, $f(-x) = f(x)$		37. $\lim_{x \rightarrow -\infty} f(x) = \infty$ and $\lim_{x \rightarrow \infty} f(x) = \infty$	
		38. $\lim_{x \rightarrow -\infty} p(x) = \infty$ and $\lim_{x \rightarrow \infty} p(x) = -\infty$	
39. $\lim_{x \rightarrow -\infty} g(x) = -\infty$ and $\lim_{x \rightarrow \infty} g(x) = \infty$		40.	