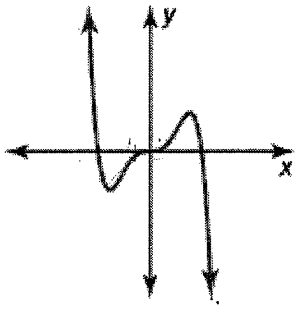
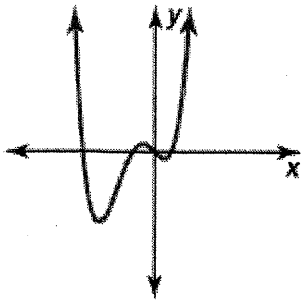
Polynomials Graph Analysis Review

1. Examine the graphs at right.

A.



B.

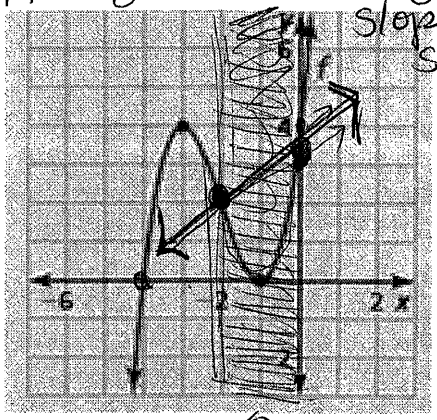


Tell whether the degree of each graph is odd or even and then tell whether the sign of the leading coefficient of each polynomial is positive or negative

GRAPH A: odd degree, negative LC

GRAPH B: even degree, positive LC

2. Given the graph of function, *f*, identify all the following:



Average rate of change = slope of secant line

↑ this is the interval [-2,0]

A. degree 3 B. sign of leading coefficient +

C. interval(s) of increase $(-\infty, -3], [-1, +\infty)$

Interval(s) of decrease $[-3, -1]$

C. end behavior as $x \to +\infty$, $f(x) \to +\infty$

as $x \to -\infty$, $f(x) \to -\infty$

What is the constant term of the polynomial? 4

F. Write an equation in factored form. $(x+4)(x+1)^2 = y$

G. There is a multiplicity of 2 at -1.

H. Where is $f(x) \le 0$? $(-\infty, -4]$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

I. Find the average rate of change on the interval $[-2,0]$ _____; on the interval $[-3,-1]$ _____

$(-2,2)$ $(0,4)$ $\frac{4-2}{0--2} = \frac{2}{2} = 1$

$(-3,4)$ $(-1,0)$ $\frac{0-4}{-1--3} = \frac{-4}{2} = -2$

Find the average rate of change on the given intervals for the given function.

3. $f(x) = 3x^4 + 2x^3 - x^2 + x - 5$ use tables in calculator or synthetic division ↙ easiest

A. $[0,2]$ $(0,-5), (2,57)$

B. $[-1,1]$ $(-1,-6), (1,0)$

C. $[5,10]$ $(5,2100), (10,31905)$

A. $\frac{57--5}{2-0} = \frac{62}{2} = 31$

B. $\frac{0--6}{1--1} = \frac{6}{2} = 3$

C. $\frac{31905-2100}{10-5} = \frac{29805}{5} = 5961$

4.

X	Y1	
-3	-6	
-2	-4	+2
-1	0	+4
0	6	+6
1	14	+8
2	24	+10
3	36	+12
4	50	+14
5	66	+16
		+18

A. $[-3,3]$

B. $[-1,6]$

C. $[-2,5]$

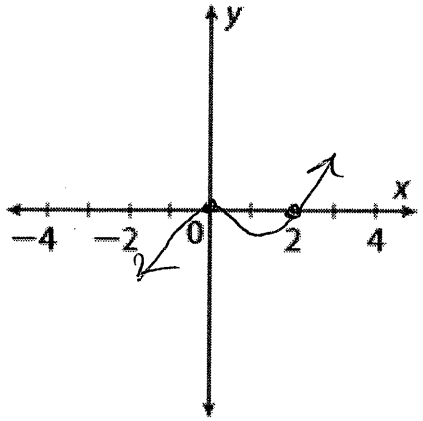
A. $(-3,-6), (3,36)$ $\frac{36--6}{3--3} = \frac{42}{6} = 7$

B. $(-1,0), (6,84)$ $\frac{84-0}{6--1} = \frac{84}{7} = 12$

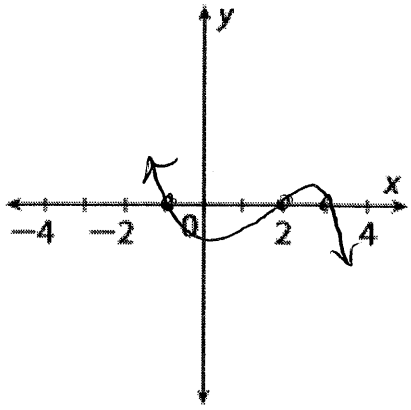
C. $(-2,-4), (5,66)$ $\frac{66--4}{5--2} = \frac{70}{7} = 10$

Sketch a graph of the polynomial **without** using a calculator.

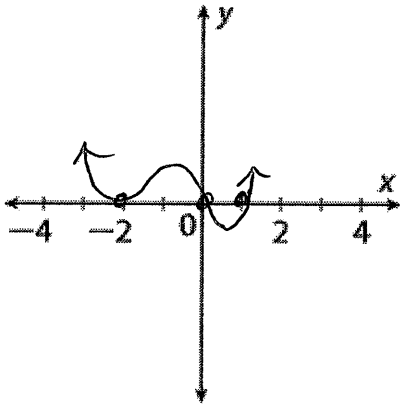
5. $f(x) = x^2(x-2)$



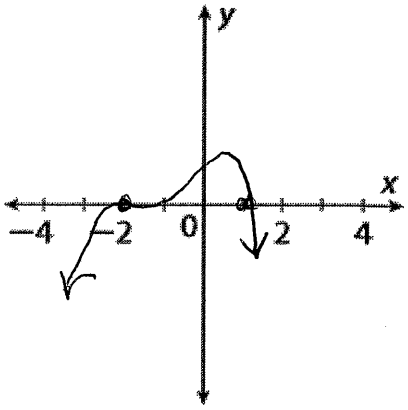
6. $f(x) = -(x+1)(x-2)(x-3)$



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



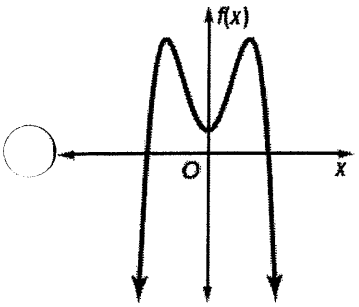
8. $f(x) = -(x-1)(x+2)^3$

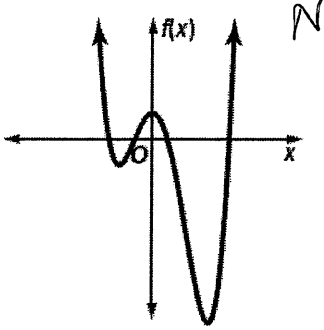


9. Tell whether the following function is *odd, even*, or *neither*.

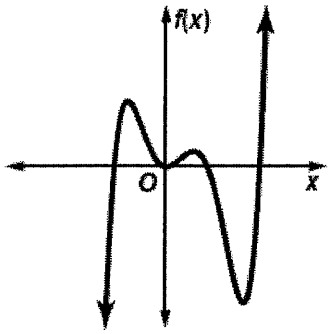
1. $f(x) = 4x^2$ E
2. $f(x) = -7x^4$ E
3. $f(x) = x^7$ O
4. $f(x) = x^3 - x^2$ N
5. $f(x) = 3x^3 + 1$ N
6. $f(x) = x^8 - x^5 - 6$ N
7. $f(x) = -8x^5 - 2x^3 + 6x$ O
8. $f(x) = x^4 - 3x^3 + 2x^2 - 6x + 1$ N
9. $f(x) = x^4 + 3x^2 + 11$ E
10. $f(x) = x^7 - 6x^5 + 2x^3 + x$ O

E





N



N

Find the average rate of change on the given intervals for the given function.

11. $f(x) = 3x^4 + 2x^3 - x^2 + x - 5$

A. $[0,2]$

B. $[-1,1]$

C. $[5,10]$

12.

A. $[-3,3]$

B. $[-1,6]$

C. $[-2,5]$

X	Y1
-3	-6
-2	-4
-1	0
0	6
1	14
2	24
3	36
4	50
5	66

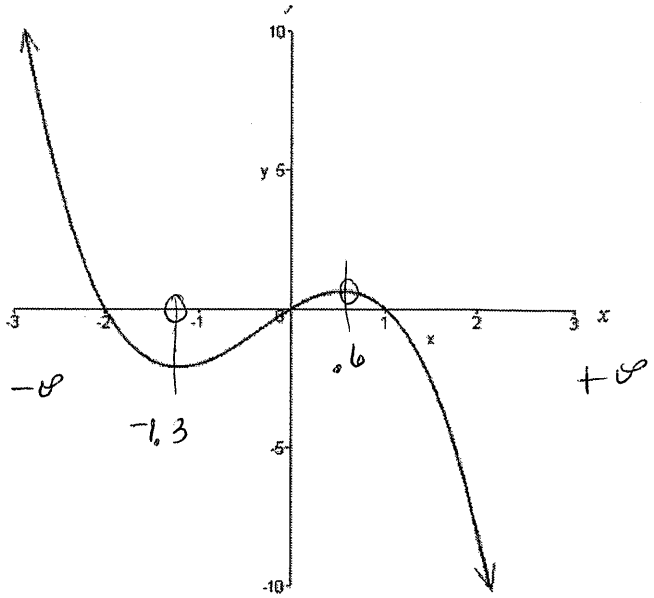
13. Complete the statement about the end behavior of the given polynomial.

A. $f(x) = x^2(x+6)(x-3)$ 4th degree, positive	as $x \to +\infty$, $f(x) \to$ $+\infty$
B. $f(x) = -2x^4 + 5x - 6$ ↙ ↘	$f(x) \to$ $-\infty$ as $x \to -\infty$
C. $f(x) = x + 2$ ↗	$f(x) \to$ $+\infty$ as $x \to +\infty$
D. $f(x) = -x(x+1)^2(x+3)^2$ 5th degree negetv	As $x \to -\infty$, $f(x) \to$ $+\infty$ ↑ ↘
E. $f(x) = x^3(2x-5)(3x-2)^2$ 6th degree positive	As $x \to +\infty$, $f(x) \to$ $+\infty$, and as $x \to -\infty$, $f(x) \to$ $+\infty$
F. $f(x) = -1$ omit; this is a constant function	$f(x) \to$ ____ as $x \to +\infty$, and $f(x) \to$ ____ as $x \to -\infty$

Analyze the graph.

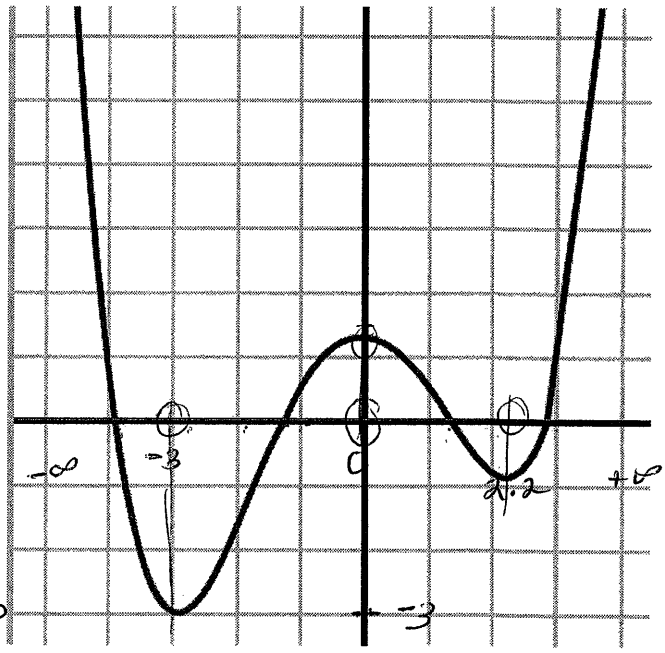
14.

a. Domain	all ℝ
b. Range	all ℝ
c. Zeros	$-2, 0, 1$
d. y-intercept	0
e. # extrema	2
f. degree of the polynomial	3
g. Is there an absolute extrema?	No
h. Interval(s) of Increase	$[-1.3, 0.6]$
i. Interval(s) of Decrease	$(-\infty, -1.3], [0.6, +\infty)$
j. You write the end behavior.	as $x \to +\infty$, $f(x) \to -\infty$ as $x \to -\infty$, $f(x) \to +\infty$



15.

a. Domain	all ℝ
b. Range	$[-3, +\infty)$
c. Zeros Approximate	$-3.9, -1.3, 1.4, 2.9$
d. y-intercept	$(0, 1.3)$
e. # extrema	3
f. degree of the polynomial	4
g. Is there an absolute extrema?	yes; a minimum
h. Interval(s) of Increase	$[-3, 0], [2.2, +\infty)$
i. Interval(s) of Decrease	$(-\infty, -3], [0, 2.2]$
j. You write the end behavior.	as $x \to +\infty$, $f(x) \to +\infty$ as $x \to -\infty$, $f(x) \to +\infty$

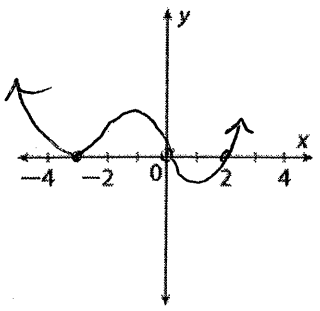


$<, >$ use parentheses $\leq, \geq$ use brackets

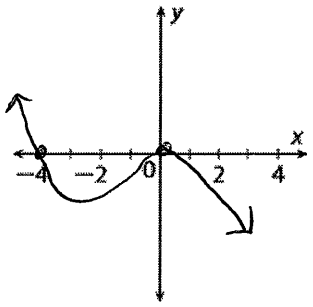
Solve the polynomial inequality. Write the solution in interval notation.

16. $x(x+3)^2(x-2) < 0$ $(0, 2)$

UNDERNEATH the x-AXIS

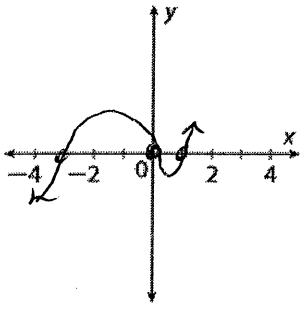


17. $-x^2(x+4) < 0$ $(-4, 0) \cup (0, +\infty)$



18. $x^3 + 2x^2 \geq 3x$ $[-3, 0] \cup [1, +\infty)$

ABOVE OR ON X-AXIS



$x^3 + 2x^2 - 3x \geq 0$

$x(x^2 + 2x - 3) \geq 0$

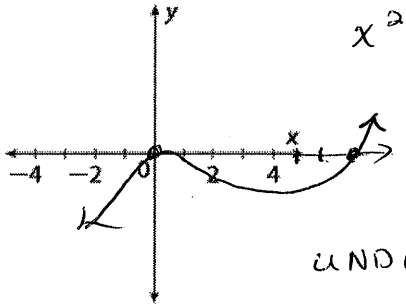
$x(x+3)(x-1) \geq 0$

$x = 0, x = -3, x = 1$

19. $x^3 - 7x^2 \leq 0$ $(-\infty, 7]$

$x^2(x-7) \leq 0$

$x = 0$ (mult 2)



UNDERNEATH OR ON THE X-AXIS