

Name _____

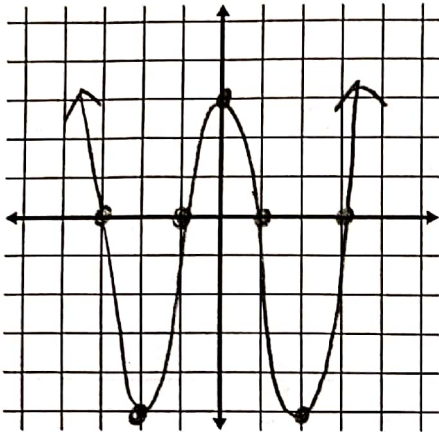
11.3 Review

Date _____

Accelerated Geometry

GRAPH EACH POLYNOMIAL FUNCTION and list all of the characteristics.

1) $f(x) = x^4 - 10x^2 + 9$; Roots = $\pm 3, \pm 1$



Local Minimum: $(-2, -15)$ $(2, -15)$

Local Maximum: $(0, 9)$

Y-Intercept: $(0, 9)$

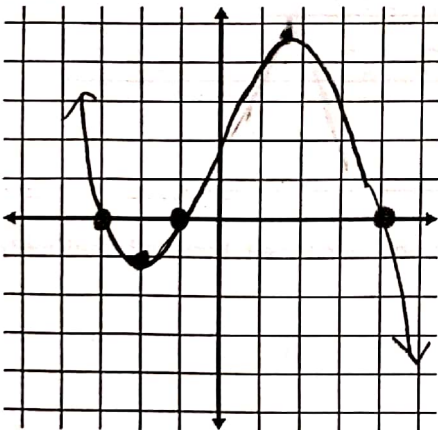
End Behavior: $\text{As } x \rightarrow -\infty, f(x) \rightarrow \infty$
 $\text{As } x \rightarrow \infty, f(x) \rightarrow \infty$

Domain: \mathbb{R} Range: $y \geq -15$

Increase: $(-2, 0)$ $(2, \infty)$

Decrease: $(-\infty, -2)$ $(0, 2)$

2) $f(x) = -x^3 + 13x + 12$; Roots = $-1, 4, -3$



$(-2, -6)$

$(1.5, 28.125)$

Local Minimum: $(-2, -6)$

Local Maximum: $(1.5, 28.125)$

Y-Intercept: $(0, 12)$

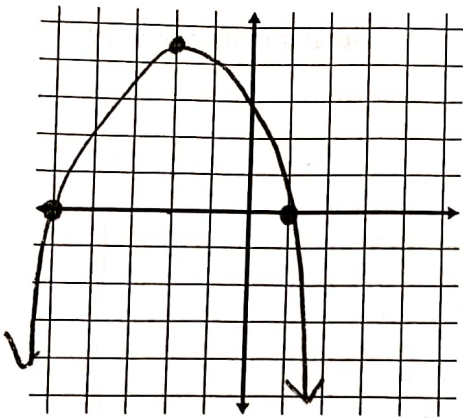
End Behavior: $\text{As } x \rightarrow -\infty, f(x) \rightarrow \infty$
 $\text{As } x \rightarrow \infty, f(x) \rightarrow -\infty$

Domain: \mathbb{R} Range: \mathbb{R}

Increase: $(-2, 1.5)$

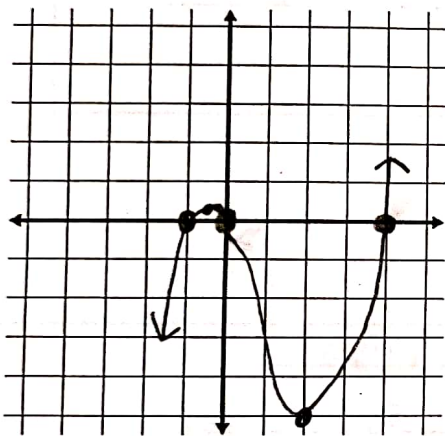
Decrease: $(-\infty, -2)$ $(1.5, \infty)$

3) $f(x) = -x^2 - 4x + 5$; Roots = -5, 1



Local Minimum: NONE
 Local Maximum: (-2, 9)
 Y-Intercept: (0, 5)
 End Behavior: as $x \rightarrow -\infty, f(x) \rightarrow -\infty$
as $x \rightarrow \infty, f(x) \rightarrow -\infty$
 Domain: \mathbb{R} Range: $y \leq 9$
 Increase: $(-\infty, -2)$
 Decrease: $(-2, \infty)$

4) $f(x) = x^5 - 3x^4 - 4x^3$; Roots = 0 mult. of 3, -1, 4

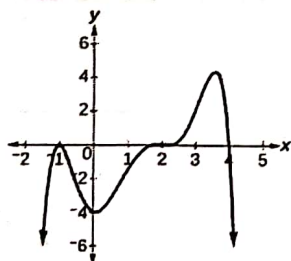


(-0.5, 2.8125)
(2, -48)

Local Minimum: (2, -48)
 Local Maximum: (-0.5, 2.8125)
 Y-Intercept: (0, 0)
 End Behavior: As $x \rightarrow -\infty, f(x) \rightarrow -\infty$
As $x \rightarrow \infty, f(x) \rightarrow \infty$
 Domain: \mathbb{R} Range: \mathbb{R}
 Increase: $(-\infty, -0.5)$ $(2, \infty)$
 Decrease: $(-0.5, 2)$

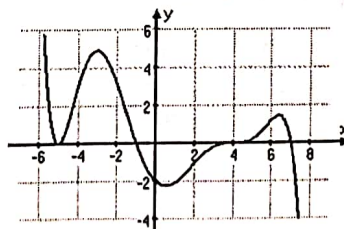
Given the following graphs, determine whether the leading coefficient is positive or negative, and whether the degree is odd or even.

5)



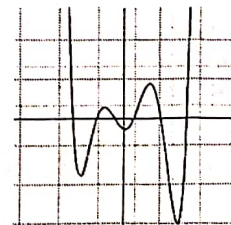
neg. LC $\frac{1}{2}$
 even degree

6)



neg. LC $\frac{1}{3}$
 odd degree

7)

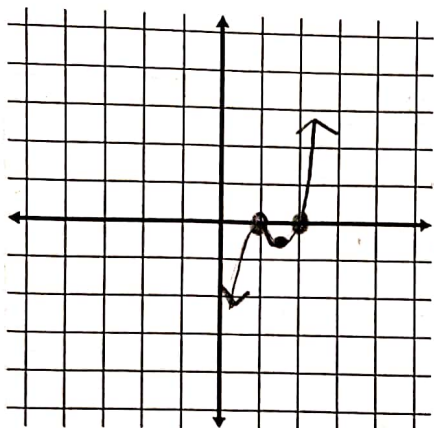


pos. LC $\frac{1}{3}$
 even degree

Find all zeros of the following polynomial functions and graph, then list all of the characteristics.

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

given that 1 is a root



Roots	<u>2, 1 mult of 2</u>
Local Minimum:	<u>(1.5, -1.25)</u>
Local Maximum:	<u>(1, 0)</u>
Y-Intercept:	<u>(0, -2)</u>
End Behavior:	<u>As $x \rightarrow -\infty, f(x) \rightarrow -\infty$</u> <u>As $x \rightarrow \infty, f(x) \rightarrow \infty$</u>
Domain:	<u>\mathbb{R}</u> Range: <u>\mathbb{R}</u>
Increase:	<u>$(-\infty, 1)$ $(1.5, \infty)$</u>
Decrease:	<u>$(1, 1.5)$</u>

$$\begin{array}{r} \underline{1} \quad | \quad 1 \quad -4 \quad 5 \quad -2 \\ \quad \downarrow \quad | \quad 1 \quad -3 \quad 2 \\ \hline 1 \quad -3 \quad 2 \quad | \quad 0 \end{array}$$

$$x^2 - 3x + 2 = 0$$

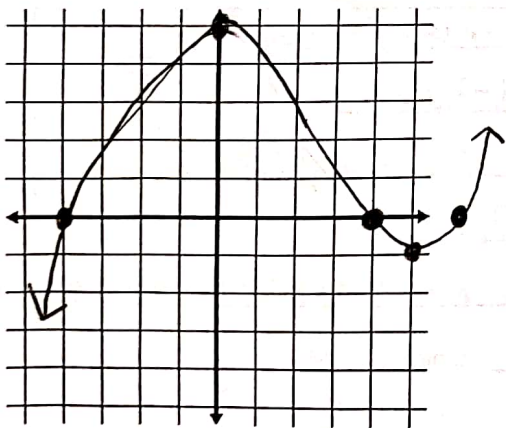
$$(x-2)(x-1)$$

(1.5, -1.25)

$x = 2, 1$

9) $f(x) = x^3 - 6x^2 - 16x + 96$

given that 6 is a root



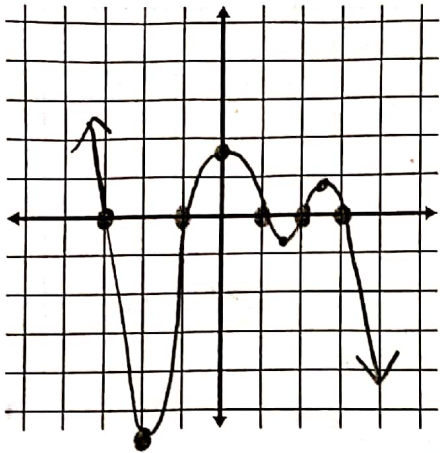
Roots	<u>$\pm 4, 6$</u>
Local Minimum:	<u>(5, -9)</u>
Local Maximum:	<u>(0, 96)</u>
Y-Intercept:	<u>(0, 96)</u>
End Behavior:	<u>As $x \rightarrow -\infty, f(x) \rightarrow -\infty$</u> <u>As $x \rightarrow \infty, f(x) \rightarrow \infty$</u>
Domain:	<u>\mathbb{R}</u> Range: <u>\mathbb{R}</u>
Increase:	<u>$(-\infty, 0)$ $(5, \infty)$</u>
Decrease:	<u>$(0, 5)$</u>

$$\begin{array}{r} \underline{6} \quad | \quad 1 \quad -6 \quad -16 \quad 96 \\ \quad \downarrow \quad | \quad 6 \quad 0 \quad -96 \\ \hline 1 \quad 0 \quad -16 \quad | \quad 0 \end{array}$$

$$x^2 - 16 \quad (5, -9)$$

$$x = \pm 4$$

10) $f(x) = -x^5 + 2x^4 + 10x^3 - 20x^2 - 9x + 18$ given that 2 is a root



$$\begin{array}{r|rrrrrr} 2 & -1 & 2 & 10 & -20 & -9 & 18 \\ & \downarrow & -2 & 0 & 20 & 0 & -18 \\ \hline & -1 & 0 & 10 & 0 & -9 & 0 \end{array}$$

$$-(x^4 - 10x^2 + 9)$$

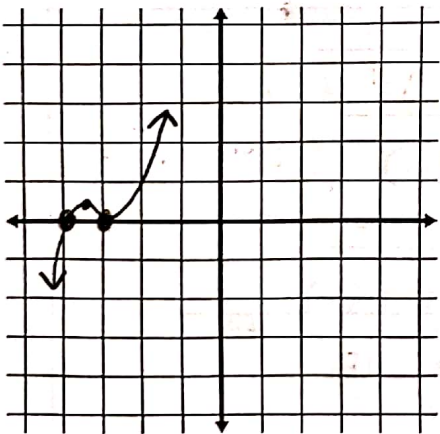
$$(x^2 - 9)(x^2 - 1)$$

$$x = \pm 3, \pm 1$$

Roots	$\pm 3, \pm 1, 2$
Local Minimum:	$(-2, -60) (1.5, -4.2)$
Local Maximum:	$(0, 18) (2.5, 7.2)$
Y-Intercept:	$(0, 18)$
End Behavior:	As $x \rightarrow -\infty, f(x) \rightarrow \infty$. As $x \rightarrow \infty, f(x) \rightarrow -\infty$
Domain:	\mathbb{R} Range: \mathbb{R}
Increase:	$(-2, 0) (1.5, 2.5)$
Decrease:	$(-\infty, -2) (0, 1.5) (2.5, \infty)$

$(-2, -60)$ $(2.5, 7.2)$
 $(0, 18)$
 $(1.5, -4.2)$
 given that -4 is a root

11) $f(x) = x^3 + 10x^2 + 33x + 36$



$$\begin{array}{r|rrrr} -4 & 1 & 10 & 33 & 36 \\ & \downarrow & -4 & -24 & -36 \\ \hline & 1 & 6 & 9 & 0 \end{array}$$

$$x^2 + 6x + 9$$

$$(x+3)^2 = 0$$

$$x = -3 \text{ mult. of } 2$$

Roots	$-4, -3 \text{ mult. of } 2$
Local Minimum:	$(-3, 0)$
Local Maximum:	$(-3.5, 125)$
Y-Intercept:	$(0, 36)$
End Behavior:	As $x \rightarrow -\infty, f(x) \rightarrow -\infty$. As $x \rightarrow \infty, f(x) \rightarrow \infty$
Domain:	\mathbb{R} Range: \mathbb{R}
Increase:	$(-\infty, -3.5) (-3, \infty)$
Decrease:	$(-3.5, -3)$

$(-3.5, 125)$