Day 04: Analyzing Graphs of Polynomial Functions

Name ________________________

Date ______________ Block _____

1-10: For each polynomial, state the requested information & sketch the graph WITHOUT a calculator.

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

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: _____________

terrace at: ___________

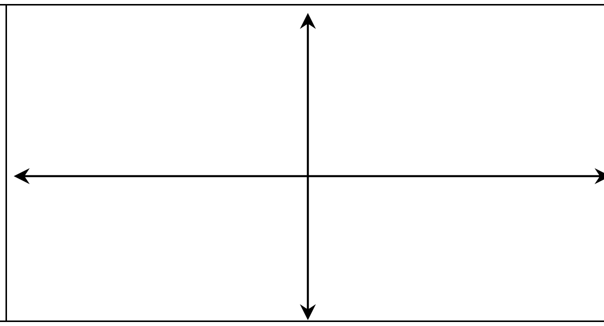
as $x \to -\infty$: _____________

as $x \to +\infty$: _____________

Estimate the x-coordinates for:

local max(s): ___________

local min(s): ___________



Sign Change Chart:

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

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: _____________

terrace at: ___________

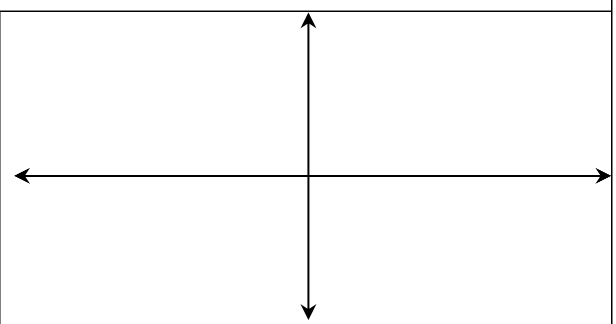
as $x \to -\infty$: _____________

as $x \to +\infty$: _____________

Estimate the x-coordinates for:

local max(s): ___________

local min(s): ___________



Sign Change Chart:

3. $f(x) = (x + 2)^3(x - 3)^2(x^2 - 49)$

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: _____________

terrace at: ___________

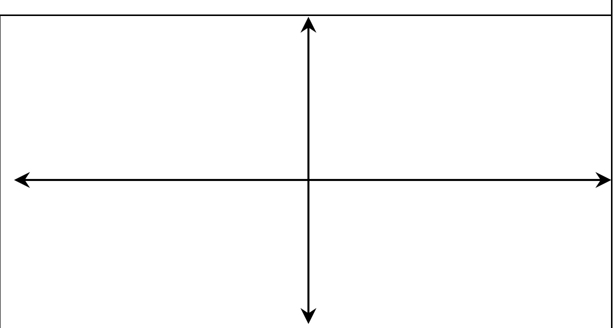
as $x \to -\infty$: _____________

as $x \to +\infty$: _____________

Estimate the x-coordinates for:

local max(s): ___________

local min(s): ___________



Sign Change Chart:

4. $f(x) = (x + 4)^4(x + 1)(x - 3)^3$

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: ____________

terrace at: ____________

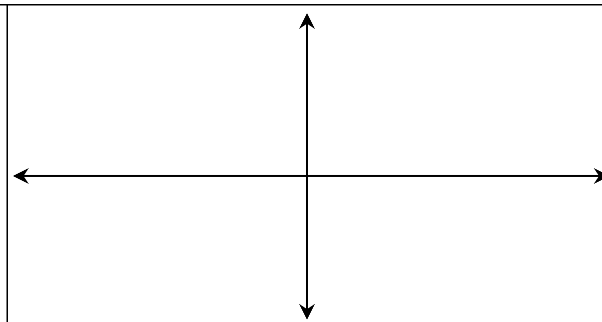
as $x \to -\infty$: ____________

as $x \to +\infty$: ____________

Estimate the x-coordinates for:

local max(s): ____________

local min(s): ____________



Sign Change Chart:

5. $f(x) = -x^2(x + 3)(x - 5)(x^2 - 9)^2$

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: ____________

terrace at: ____________

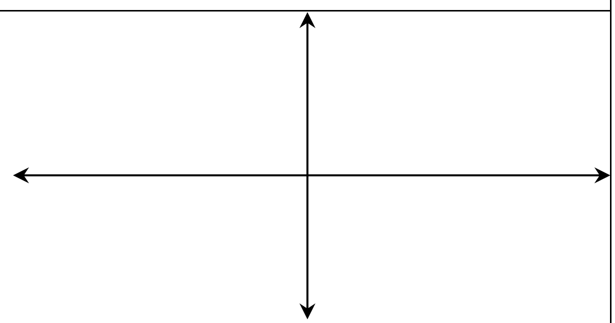
as $x \to -\infty$: ____________

as $x \to +\infty$: ____________

Estimate the x-coordinates for:

local max(s): ____________

local min(s): ____________



Sign Change Chart:

6. $f(x) = -x(x^3 + 2x^2)(x^2 + 2x - 15)$

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: ____________

terrace at: ____________

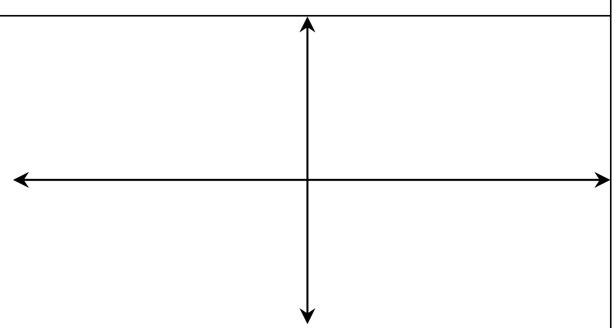
as $x \to -\infty$: ____________

as $x \to +\infty$: ____________

Estimate the x-coordinates for:

local max(s): ____________

local min(s): ____________



Sign Change Chart:

7. $f(x) = (x^2 - 4)(2x - 1)(x + 5)^2$

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: _____________

terrace at: ___________

as $x \rightarrow -\infty$: _____________

as $x \rightarrow +\infty$: _____________

Estimate the x-coordinates for:

local max(s): ___________

local min(s): ___________

Sign Change Chart:

8. $f(x) = (x + 1)^3(x + 4)^2(x^2 - 25)$

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: _____________

terrace at: ___________

as $x \rightarrow -\infty$: _____________

as $x \rightarrow +\infty$: _____________

Estimate the x-coordinates for:

local max(s): ___________

local min(s): ___________

Sign Change Chart:

9. $f(x) = -(x + 2)^4(x + 5)(x - 6)^3$

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: _____________

terrace at: ___________

as $x \rightarrow -\infty$: _____________

as $x \rightarrow +\infty$: _____________

Estimate the x-coordinates for:

local max(s): ___________

local min(s): ___________

Sign Change Chart:

10. f(x) = $x^3(x - 1)(x - 5)(x^2 - 16)^2$

degree: ____________

even or odd: ____________

max turns: ____________

max x-int: ____________

zeros at: ____________________

tangent at: ____________

terrace at: ___________

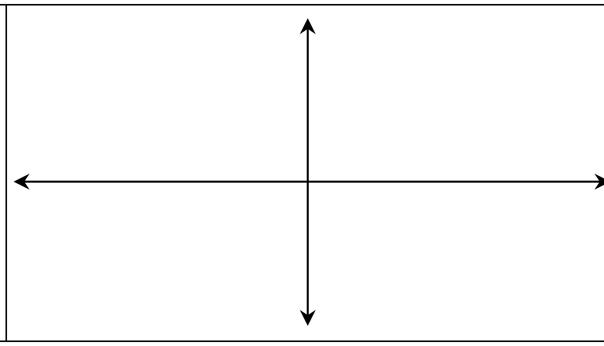
as x → -∞: ____________

as x → +∞: ____________

Estimate the x-coordinates for:

local max(s): ___________

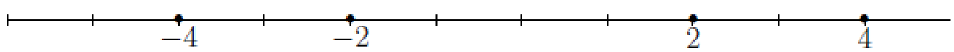
local min(s): ___________



Sign Change Chart:

Sign Charts & the Test Interval Technique

Consider the function $p(x) = (x+4)(x+2)^2(x-2)(x-4)^2$. Note that $p(x)$ is already in *factored form*. The zeros of a polynomial in factored form can be read off without trouble. We have $x = -4, -2, 2$ and 4. The *multiplicities* of -2 and 4 are two. Thus we have four branch points as shown on the chart below.



Note that the four branch points divide the number line into five test intervals, $(-\infty, -4), (-4, -2), (-2, 2), (2, 4), (4, \infty)$. Select a *test point* from each interval. Let's take $-5, -3, 0, 3,$ and 5.

To determine the sign of the function at each test point, build a matrix with test points listed down the side and factors listed along the top. In the current case

test point	$(x+4)$	$(x+2)^2$	$(x-2)$	$(x-4)^2$	$p(x)$
-5	$-$	$+$	$-$	$+$	$+$
-3	$+$	$+$	$-$	$+$	$-$
0	$+$	$+$	$-$	$+$	$-$
3	$+$	$+$	$+$	$+$	$+$
5	$+$	$+$	$+$	$+$	$+$