Homework:
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Math 4 Pre-Calculus
Lecture 8, Part 2

Polynomial Functions — 5.1

Polynomial Function

$f(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0$

Domain:

The **range** depends on the global behavior which can be determined by the degree of the polynomial and the sign of the leading coefficient.

y-intercept: Plug in 0 for x to find y. In other words, find $f(0)$. The y-intercept is a point: $(0\ ,\ ?)$.

x-intercept(s) or root(s) or zero(s): Find by setting $y = 0$ and solving for x. The x-intercept(s) is(are) a point(s): $(?\ ,\ 0)$.

Roots of polynomial functions will be discussed through Chapter 4.

Polynomial Functions with an ODD degree

Domain:

Global Behavior:

If $a > 0$, the graph is a "disco shape : right side up" . **Range**:

In mathematical terms, this means: as $x \to \infty,\ f(x) \to \infty$ and as $x \to -\infty,\ f(x) \to -\infty$

If $a < 0$, the graph is a "disco shape : left side up". **Range**:

In mathematical terms, this means: as $x \to \infty,\ f(x) \to -\infty$ and as $x \to -\infty,\ f(x) \to \infty$

Polynomial Functions with an EVEN degree

Domain:

Global Behavior:

If $a > 0$, the graph is a "touchdown shape". **Range**:

In mathematical terms, this means: as $x \to \infty,\ f(x) \to \infty$ and as $x \to -\infty,\ f(x) \to \infty$

If $a < 0$, the graph is a "   shape". **Range**:

In mathematical terms, this means: as $x \to \infty,\ f(x) \to -\infty$ and as $x \to -\infty,\ f(x) \to -\infty$

1. *Graph the equation.* $f(x) = 9x - x^3$

Domain:

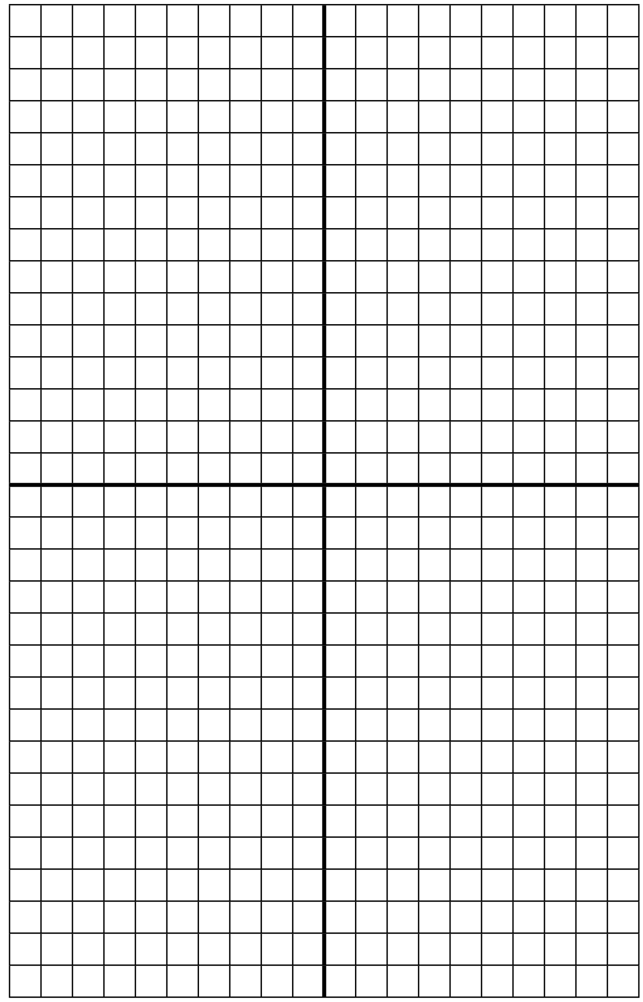
Degree:

Value of a:

Global Behavior:

Range:

Symmetry:

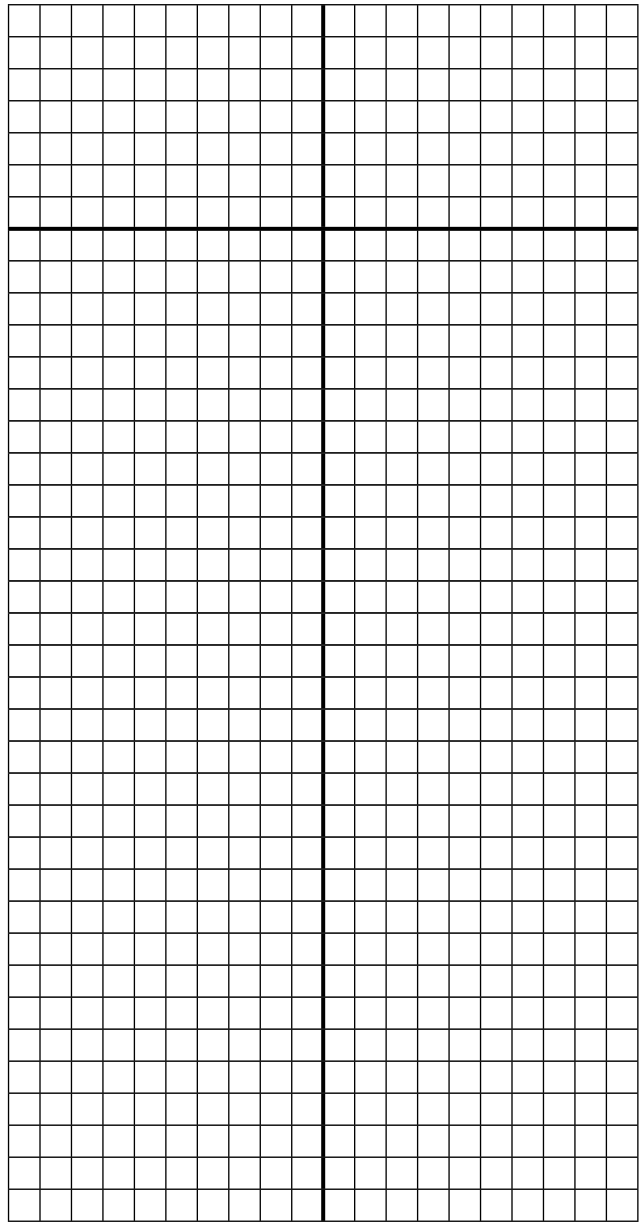


y-intercept:

x-intercept(s) or root(s) or zero(s):

Sign chart:

2. *Graph the equation.* $f(x) = -x^4 + 12x^2 - 27$



Domain:
Degree:

Value of a:

Global Behavior:

Range:

Symmetry:

y-intercept:

x-intercept(s) or root(s) or zero(s):

Sign chart:

3. *Graph the equation.* $f(x) = x^2(x+2)^2(x-1)$

Domain:

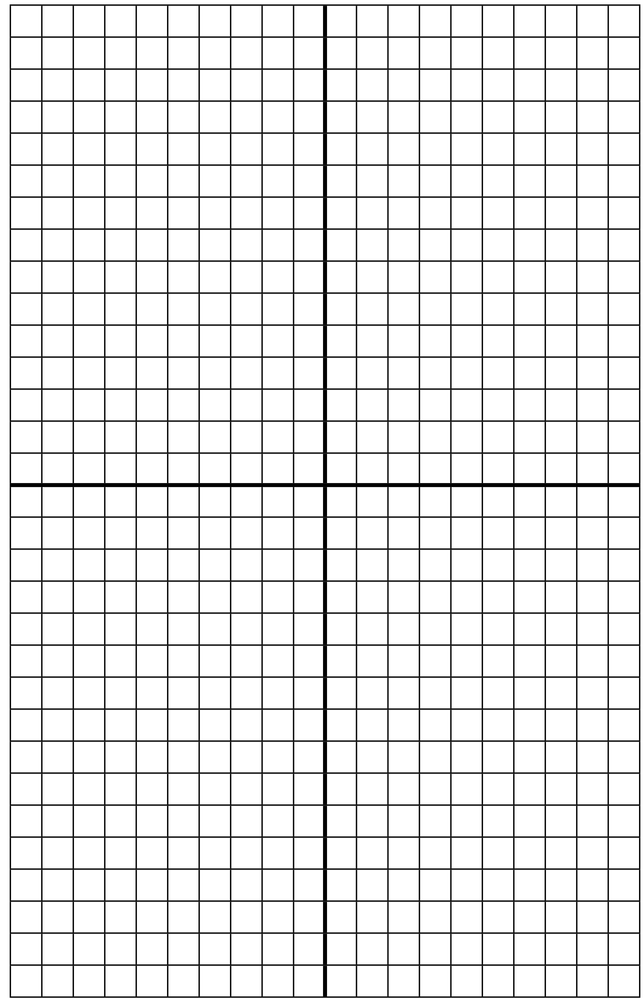
Degree:

Value of a:

Global Behavior:

Range:

Symmetry:



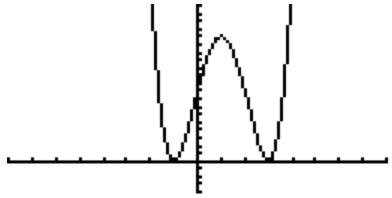
y-intercept:

x-intercept(s) or root(s) or zero(s):

Sign chart:

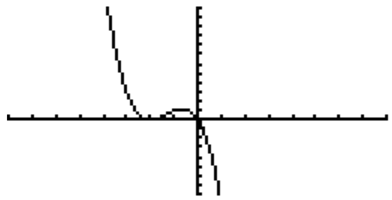
4. *Match each graph with an equation. Scales on all graphs: Xscl=1 and Yscl=1.*

a) $f(x) = x^2(x+2)^2$



b) $f(x) = -x(x+2)^2$

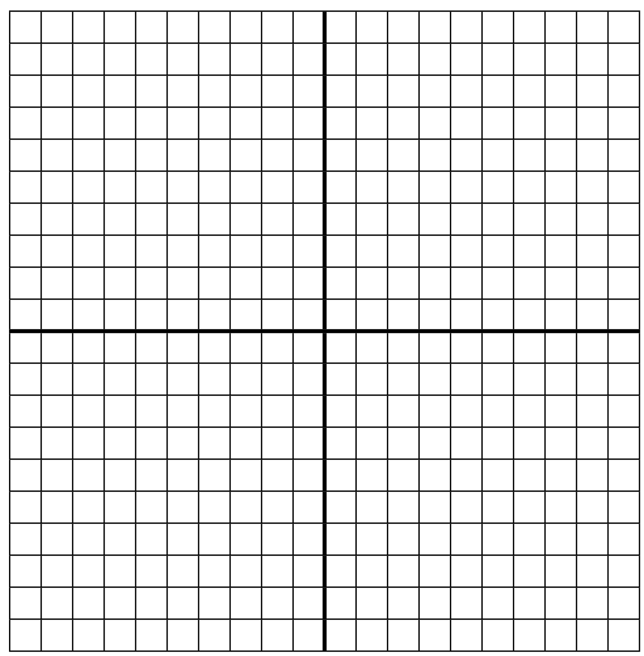
c) $f(x) = (x+1)^2(x-3)^2$



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

5. *Sketch the graph of a polynomial given the sign diagram.*

Sign of $f(x)$	+		+			+
		-4		0	2	



Intermediate Value Theorem for Polynomial Functions

If f is a polynomial function, and $f(a) \neq f(b)$ for $a < b$, then f takes on every value between $f(a)$ and $f(b)$ in the interval $[a, b]$.

Right now, we are using this theorem to prove the existence of a zero (x-intercept) between any two given x-values in which one has a positive y-value and the other has a negative y-value.

6. *Use the intermediate value theorem to show that f has a zero between a and b.*

$f(x) = 2x^3 + 5x^2 - 3$ $\quad a = -3, \; b = -2$