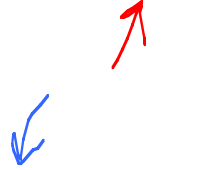
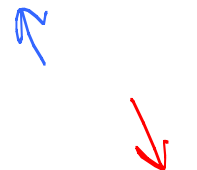
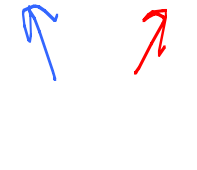

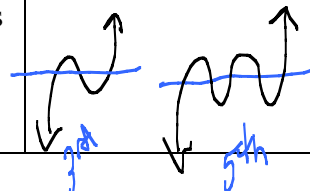
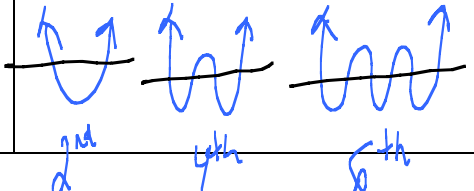


PreCalculus Class Notes P4 Polynomials: Summary of Characteristics; Writing Equations of Polynomials

Summary of Characteristics of Polynomial Functions

<u>Degree</u>	Odd x, x^3, x^5		Even x^0, x^2, x^4	
Leading coefficient	Positive	Negative	Positive	Negative
End behavior				
Possible number of roots	At least one real root; Maximum number of roots = degree		Could have zero real roots; Maximum number of roots = degree	
Possible number of turning points	Even number, maximum \leq degree - 1 		Odd number, maximum \leq degree - 1 	

Writing Equations of Polynomials

Rational Roots: roots are opposite of coefficients in factors

Root	$r = 3$	$r = -2$	$r = 1/2$	$r = -2/3$
Factor	$(x - 3)$	$(x + 2)$	$x = \frac{1}{2}$ $2x = 1$ $2x - 1 = 0$ $(2x - 1)$	$(3x + 2)$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Irrational Roots: result from a quadratic factor; occur in conjugate pairs; write factor by working backwards

$r_1 = 1 + \sqrt{5}$	$r_1 = 2 - \sqrt{3}$
$r_2 = 1 - \sqrt{5}$	$r_2 = 2 + \sqrt{3}$
$x = 1 \pm \sqrt{5}$ $(x-1)^2 = (\pm\sqrt{5})^2$ $x^2 - 2x + 1 = 5$ $x^2 - 2x - 4 = 0$ $(x^2 - 2x - 4)$	$x = 2 \pm \sqrt{3}$ $(x-2)^2 = (\pm\sqrt{3})^2$ $x^2 - 4x + 4 = 3$ $x^2 - 4x + 1 = 0$ $(x^2 - 4x + 1)$

How the y-intercept changes the equation

Criteria: Write an equation with roots at $x = 2$ and $x = -3$ and a y-intercept of 12

First, write equation with correct roots and find y-intercept as is.

$$-6(-2) = +12$$

$y = (x-2)(x+3)$	Add/subtract to shift to the new y-intercept	Multiply by a constant to stretch to a new y-intercept
Find current y-intercept, set $x = 0$ $y = (0-2)(0+3) = (-2)(3) = -6$	$y = (x-2)(x+3) + 18$	$y = (-2)(x-2)(x+3)$
roots are correct y-int is wrong Did it work?	y-int is right but roots are wrong	roots / y-int correct

Then, modify equation by multiply by a constant to get the new y-intercept.

Write the equation of a polynomial that meets the following criteria:

<p>Roots: $r_1 = \sqrt{7}; r_2 = \frac{-1}{2}; r_3 = -5$ y-intercept: $y = 5$</p>	<p>Roots: $r_1 = 1 - \sqrt{3}$; double root at $r_2 = -1$; $r_3 = \frac{2}{3}$ y-intercept: $y = -12$</p>
<p>$x^2 = (\pm\sqrt{7})^2$ $x^2 = 7$ $x^2 - 7 = 0$ $y = a(x^2 - 7)(2x + 1)(x + 5)$ y-int $5 = a(-7)(1)(5)$ $5 = -35a$ $\frac{-5}{-35} = a \quad a = \frac{-1}{7}$ $y = \frac{-1}{7}(x^2 - 7)(2x + 1)(x + 5)$</p>	<p>$x = 1 \pm \sqrt{3}$ $(x - 1)^2 = (\pm\sqrt{3})^2$ $x^2 - 2x + 1 = 3$ $x^2 - 2x - 2 = 0$ $y = a(x^2 - 2x - 2)(x + 1)^2(3x - 2)$ $-12 = a(-2)(1)^2(-2)$ $-12 = 4a$ $-3 = a$ $y = -3(x^2 - 2x - 2)(x + 1)^2(3x - 2)$</p>