Name: _____ Date: _____
PC Ms. Loughran

Do Now:

1. Find all zeros of $P(x)$:

$$P(x) = x^5 - 2x^4 + x^3 - x^2 + 2x - 1$$

$\text{prz} = \frac{\pm 1}{\pm 1} = \pm 1$

$P(1) = 0$
$P(-1) \neq 0$

1	1	-2	1	-1	2	-1
		1	-1	0	-1	1
1	1	-1	0	-1	1	0
		1	0	0	-1	
	1	0	0	-1	0	

$(x-1)^2(x^3-1) = 0$

$(x-1)^2(x-1)(x^2+x+1) = 0$

$(x-1)^3(x^2+x+1) = 0$

$x = 1$ (triple) | $x^2+x+1 = 0$

$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(1)}}{2(1)}$

$x = \frac{-1 \pm \sqrt{-3}}{2} = \frac{-1 \pm i\sqrt{3}}{2}$

Name:_____ Date:_____

PC: Sketching Polynomials without a Graphing Calculator Ms. Loughran

Sketch the general graph of each function without your graphing calculator.

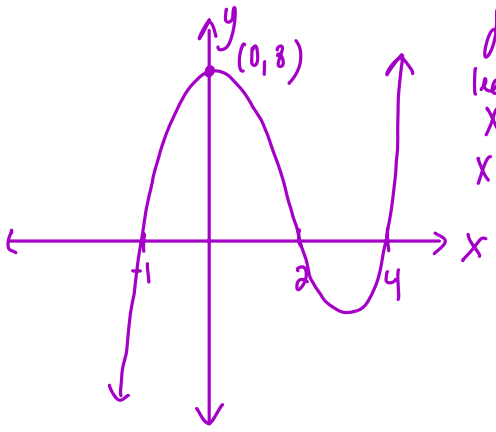
1. $f(x) = (x + 1)(x - 2)(x - 4)$

Zeros: $-1, 2, 4$

y-intercept: $(0, 8)$

f(x) − + − +

-1 2 4



degree: 3 odd
leading coefficient: +
$x \to \infty$, $f(x) \to \infty$
$x \to -\infty$, $f(x) \to -\infty$

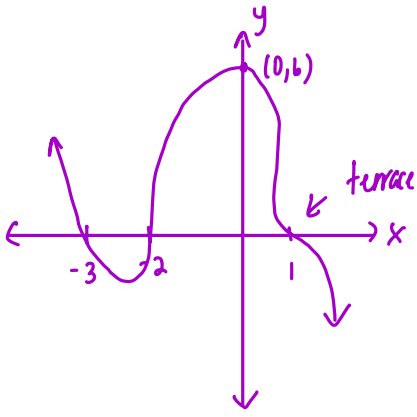
2. $f(x) = -(x + 3)(x + 2)(x - 1)^3$

Zeros: $-3, -2, 1$ (triple)

y-int: $(0, 6)$

f(x) + − + −

-3 -2 1



degree: 5 (odd)
leading coefficient ⊖

we have terrace pts at any zeros that have an odd multiplicity greater than 1

− + +

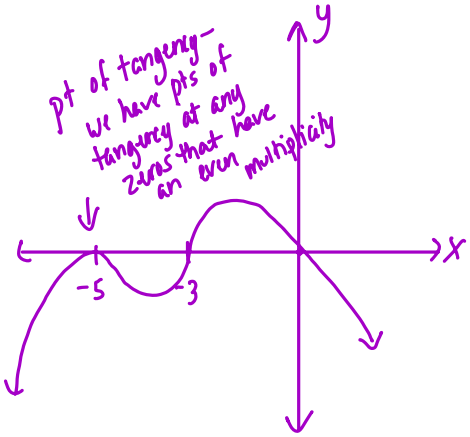
3. $f(x) = -x(x + 5)^2(x + 3)$

Zeros: $0, -5$ (double), -3

y-int: $(0, 0)$

f(x) − − + −

-5 -3 0



pt of tangency
we have pts of tangency at any zeros that have an even multiplicity

degree: 4 (even)
leading coefficient ⊖

+ + +

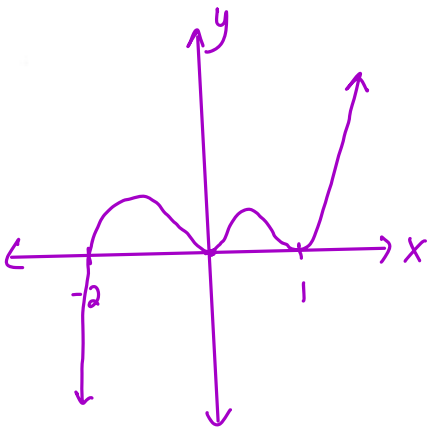
4. $f(x) = x^2(x - 1)^2(2 + x)$

Zeros: 0 (double), 1 (double), -2

y-int: (0, 0)

f(x) − + + +

-2 0 1



degree: 5 (odd)

leading coefficient: ⊕

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

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

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

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

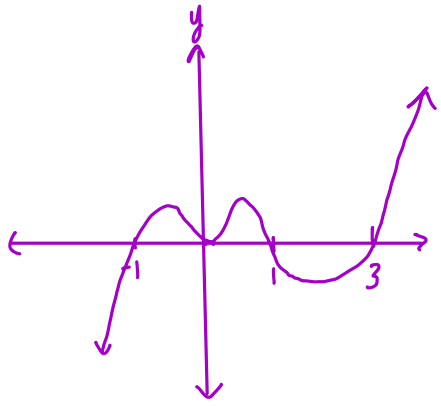
$f(x) = x^2(x+1)(x-1)(x-3)$

Zeros: 0 (double), ±1, 3

y-int: (0, 0)

f(x) − + + − +

-1 0 1 3



degree: 5 (odd)

leading coefficient ⊕

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

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

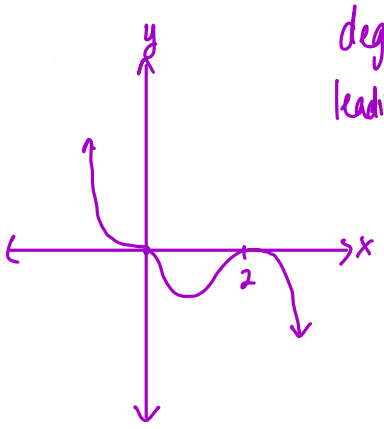
$f(x) = -x^3(x-2)^2$

Zeros: 0 (triple), 2 (double)

y-int: (0, 0)

f(x) + − −

0 2



degree: 5 odd

leading coefficient ⊖

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

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

Graphs of Polynomial Functions: End behavior

	Odd degree		Even degree	
Sign of Leading Coefficient	Positive	Negative	Positive	Negative
End behavior	↙ ↗	↖ ↘	↖ ↗	↙ ↘

Pre-Calculus

SKETCHING POLYNOMIAL GRAPHS

L. Lewis

Sketch each of the following:

1. $y = x^2$
2. $y = (x - 2)^2$
3. $y = -(x + 3)^2$
4. $y = (x + 1)(x - 2)(x - 3)$
5. $y = (x + 1)(x - 2)(3 - x)$
6. $y = x(x - 1)^2$
7. $y = -x(x - 2)^2$
8. $y = x^2(x + 2)(x - 2)$
9. $y = x^3(x - 3)$
10. $y = -x(x - 1)(x + 2)$
11. $y = x^3 - 6x^2 + 9x$
12. $y = x^2(x - 4)$
13. $y = (x + 2)^3$
14. $y = x(x - 1)(x - 3)(x + 2)$
15. $y = x(1 - x)(x - 2)(x + 3)$
16. $y = x(x + 1)(x - 3)^2$
17. $y = x^4 - 5x^2 + 4$
18. $y = 3x^3 - x^4$
19. $y = x^2(x - 1)(x + 2)(x + 3)$
20. $y = (1 - x)(2 - x)(3 - x)(4 - x)(5 - x)$

Homework 12-12

(4) $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}, \pm \frac{1}{6}$

(11) $\{-2 \text{ (double)}, 1\}$

(12) $\{1, 2, 4\}$

(13) $\{2, -1 \text{ (double)}\}$

(14) $\{-3 \text{ (double)}, 2\}$

(15) $\{2 \text{ (triple)}\}$

(16) $\{-3, 2 \text{ (double)}\}$