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MATH 195

§ 3.2 POLYNOMIALS & THEIR GRAPHS

1-4, 9-14, 29, 31, 51-54 AND 19, 24, 26, 38, 43

1. II

EACH OF THE OTHERS HAS EITHER
CUSPS (CORNERS), BREAKS, OR GAPS.

2. (a) ODD DEGREE WITH LEAD COEFFICIENT > 0

$y \to \infty$ AS $x \to \infty$

$y \to -\infty$ AS $x \to -\infty$

(b) EVEN DEGREE WITH LEAD COEFFICIENT < 0

$y \to -\infty$ AS $x \to \infty$

$y \to -\infty$ AS $x \to -\infty$

3. (a) 0 (b) FACTOR (c) x

4. (a) ONLY

NOTE: $f(x) = x^3$ SATISFIES (b)

$f(x) = -x^4$ SATISFIES (c)

9. (a) ODD DEGREE (3)
LEAD COEFF > 0

$y \to \infty$ AS $x \to \infty$

$y \to -\infty$ AS $x \to -\infty$

(b) III

10. (a) EVEN DEGREE (4)
LEAD COEFF < 0

$y \to -\infty$ AS $x \to \infty$

$y \to -\infty$ AS $x \to -\infty$

(b) I

11. (a) ODD DEGREE (5)

LEAD COEFF < 0

$y \to -\infty$ AS $x \to \infty$

$y \to \infty$ AS $x \to -\infty$

(b) V BECAUSE IT HAS 5 ROOTS.

12. EVEN DEGREE (6)

LEAD COEFF > 0

$y \to \infty$ AS $x \to \infty$

$y \to \infty$ AS $x \to -\infty$

(b) II BECAUSE IT'S AN EVEN FUNCTION

13. (a) EVEN DEGREE (4)

LEAD COEFF > 0

$y \to \infty$ AS $x \to \infty$

$y \to \infty$ AS $x \to -\infty$

(b) VI

14. (a) ODD DEGREE (3)

LEAD COEFF < 0

$y \to -\infty$ AS $x \to \infty$

$y \to \infty$ AS $x \to -\infty$

(b) IV

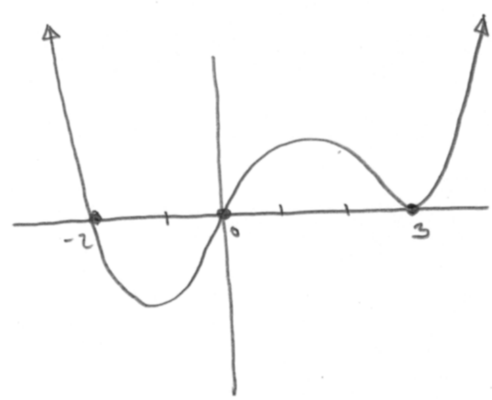
NOTE: IF END BEHAVIOR ALONE IS NOT ENOUGH TO IDENTIFY THE GRAPH, REMEMBER THAT THE X-INTERCEPTS ARE ZEROS OF THE POLYNOMIAL. SO PLUGGING IN THESE VALUES SHOULD GIVE 0 IF YOU'RE PLUGGING THEM INTO THE CORRECT CORRESPONDING FUNCTION.

21.

FACTOR	ZERO	MULTIPLICITY
x^3	0	3
$(x+2)$	-2	1
$(x-3)^2$	3	2
	+	
		6TH DEGREE

6TH DEGREE

LEAD COEFF > 0



31. $P(x) = x^3 - x^2 - 6x$

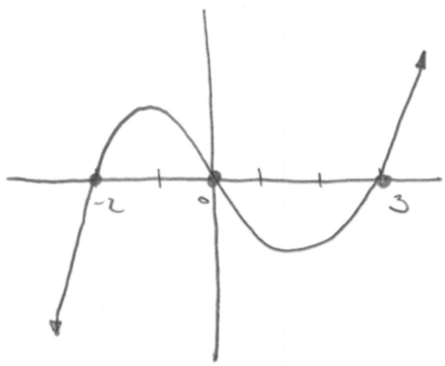
$= x(x^2 - x - 6)$

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

FACTOR	ZERO	MULTIPLICITY
x	0	1
$x-3$	3	1
$x+2$	-2	1

DEGREE 3

LEAD COEFF > 0



51. (a) x-INT: 0, 4

y-INT: 0

(b) LOCAL MAX (2, 4)

52. (a) x-INT: 0, 4.5

y-INT: 0

(b) LOCAL MAX: (0, 0)

LOCAL MIN: (3, -3)

53. (a) x-INT: -2, 1

y-INT: -1

(b) LOCAL MIN: (-1, -2)

LOCAL MAX: (1, 0)

54. (a) x-INT: 0, 4

y-INT: 0

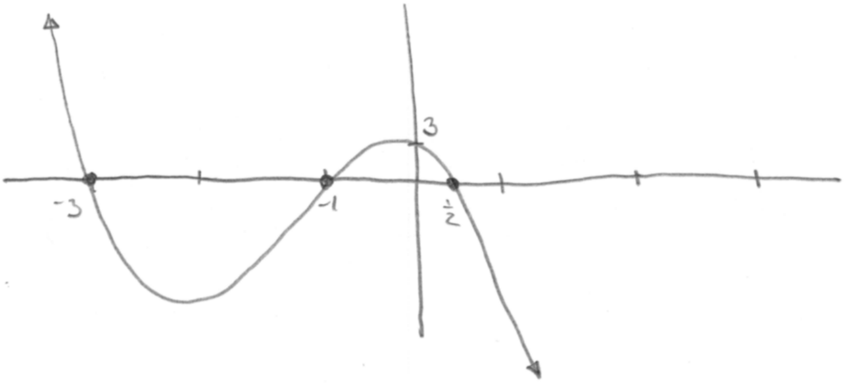
(b) LOCAL MIN: (3, -3)

19. $P(x) = -(2x-1)(x+1)(x+3)$

DEGREE 3 (ODD)

LEAD COEFF < 0

FACTOR	ZERO	MULT.
$2x-1$	$\frac{1}{2}$	1
$x+1$	-1	1
$x+3$	-3	1

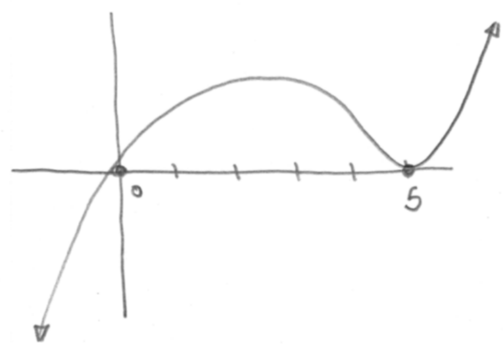


24. $P(x) = \frac{1}{5}x(x-5)^2$

DEGREE 3 (ODD)

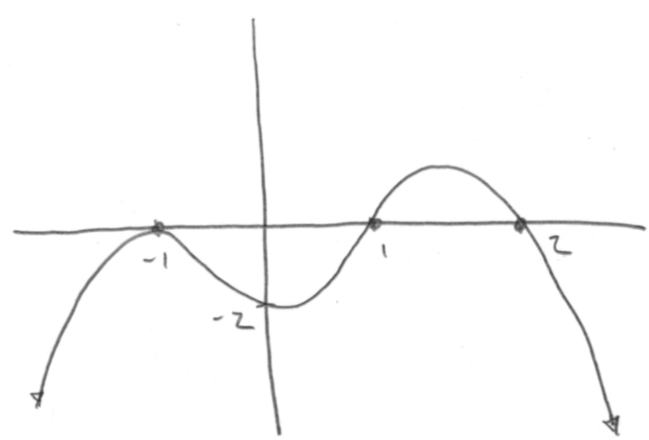
LEAD COEFF > 0

FACTOR	ZERO	MULT
$\frac{1}{5}x$	0	1
$(x-5)^2$	5	2



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

FACTOR	ZERO	MULT
$(x+1)^2$	-1	2
$(x-1)^3$	1	3
$x-2$	2	1



DEGREE 6 (EVEN)

LEAD COEFF < 0

38. $P(x) = x^3 + 3x^2 - 4x - 12$

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

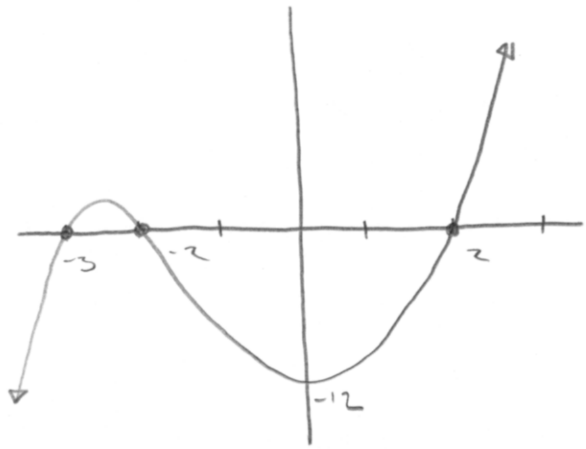
$= (x^2 - 4)(x+3)$

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

FACTOR	ZERO	MULT
$x+2$	-2	1
$x-2$	2	1
$x+3$	-3	1

DEGREE 3 (ODD)

LEAD COEFF > 0



43. $P(x) = x^4 - 3x^2 - 4$ ← THIS IS "QUADRATIC IN x^2"

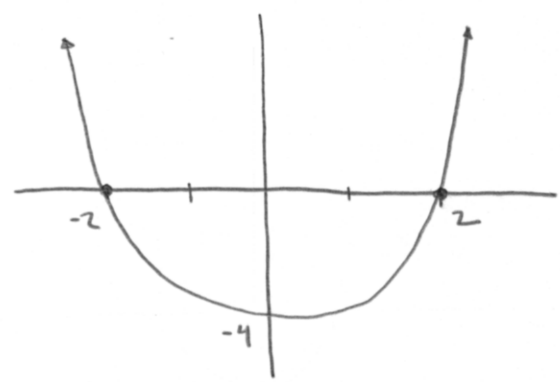
$= (x^2 - 4)(x^2 + 1)$

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

DEGREE 4 (EVEN)

LEAD COEFF > 0

FACTOR	ZERO	MULT
$x+2$	-2	1
$x-2$	2	1
x^2+1	NONE	ϕ



(TECHNICALLY, $x^2 + 1 = (x+i)(x-i)$

SO THE ZEROS ARE $\pm i$ (IMAGINARY)

EACH WITH MULT. 1.)