Secondary Math
Module 3 Study Guide
Polynomials

Directions: Show all work.

Identify the following functions as linear, exponential, quadratic, cubic, quartic or logarithmic.

1.

x	y
0	1
1	2
2	4
3	8

2.

x	y
0	0
1	1
2	8
3	27

3.

x	y
1	0
2	1
4	2
8	3

4.

x	y
0	1
1	2
2	4
3	7

5.

x	y
0	1
1	2
2	3
3	4

Use the equations below to answer questions 6-9.

$f(x) = x + 1$ $g(x) = x^2 + 2$ $h(x) = x^3 + 3$

6. Find $f(x) + g(x)$

7. Find $f(x) - g(x)$

8. Find $f(x) \cdot g(x)$

9. Find $f(x)[h(x) + g(x)]$

Solve for x for questions 10-12.

10. $(x + 4)(x - 3)(x + 1) = 0$

11. $x^2 + 4x = -3$

12. $9x^2 - 25 = 0$

For 13-14: Use the Remainder Theorem to determine if the following are roots of the given polynomial; State the remainder and YES OR NO, it is a root/factor.

13. $(n^3 + n^2 - 28n + 28); f(-4)$.

14. $(x^3 + 3x^2 - 59x + 30) \div (x - 6)$.

For 15-16: Write a polynomial for the given information in Factored Form AND Standard Form:

15. Given: leading coefficient of 2, and the following roots: -1, 2, -3.

Factored: $2(x+1)(x-2)(x+3)$

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

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

	x^3	$-x^2$	$-2x$
x			
$+3$	$3x^2$	$-3x$	-6

$2(x^3+2x^2-5x-6)$

Standard: $2x^3+4x^2-10x-12$

16. Given: leading coefficient of -3, and the following roots: 4, 2i, and $-2i$.

Factored: $-3(x-4)(x-2i)(x+2i)$

$(x+2i-2i-4i)(-1)$

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

$x^3+4x-4x^2-16$

order

$-3(x^3-4x^2+4x-16)$

Standard: $-3x^3+12x^2-12x+48$

For 17-18: Divide the following polynomials to factor COMPLETELY, state ALL roots:

17. $x+2 \overline{)x^3+3x^2-10x-24}$

x^2+x-12

$-x^3-2x^2$

$-10x-24$

$-x^2-2x$

$-12x-24$

$-(-12x+24)$

0

-12: 4×-3, 1

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

X= -2, -4, 3

18. $3x-1 \overline{)3x^3-16x^2+20x-5}$ typo

x^2-5x+5

$-3x^3+x^2$

$-15x^2+20x-5$

$+15x^2-5x$

$15x-5$

$-15x+5$

0

5: CANT, -5

$(3x-1)=0$

$+1$

$\frac{1}{3}$

X= $\frac{1}{3}$, _____, _____

Graph the following functions, make sure to label all points clearly.

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

Roots, including multiplicity:

-2 bounce, 3 bounce

Degree of function: 4 (How many x's?)

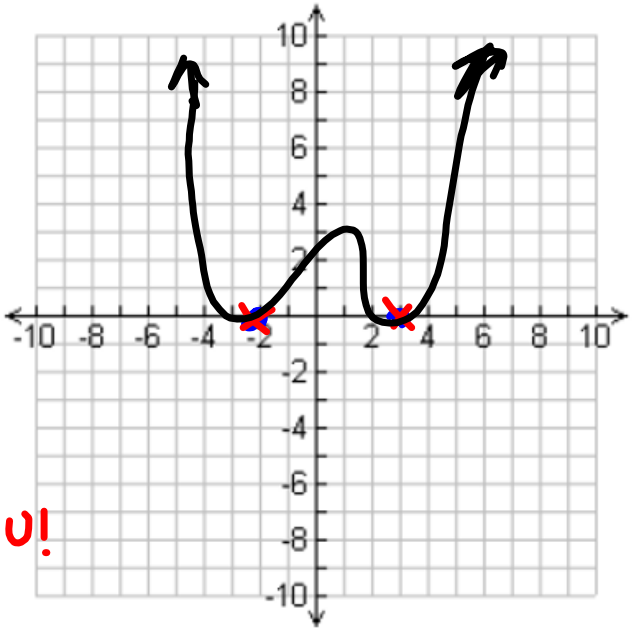
Degree: (circle) odd or even

Leading coefficient: positive or negative

End Behavior:

As $x \to -\infty, f(x) \to$ ∞.

As $x \to \infty, f(x) \to$ ∞.



20. $f(x) = -(x-4)^4(x-1)^2$ ~x^6 (neg ↓, even, power of 2! U!)

Roots, including multiplicity:

4 bounce, 1 bounce

Degree of function: 6

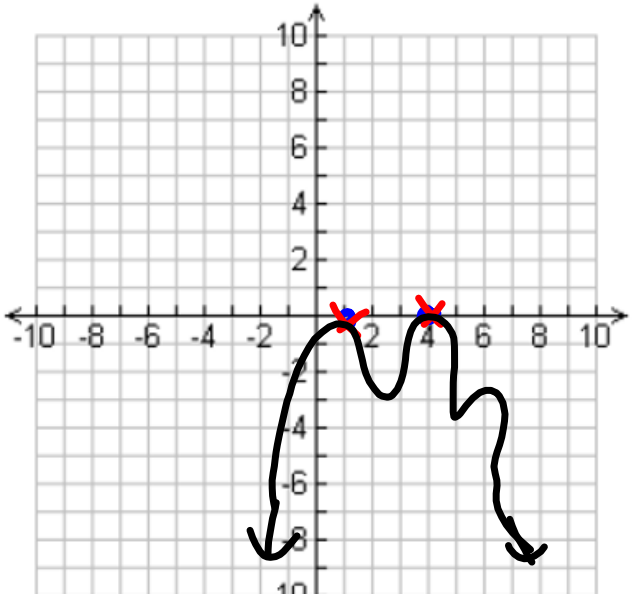
Degree: (circle) odd or even

Leading coefficient: positive or negative

End Behavior:

As $x \to -\infty, f(x) \to$ _____.

As $x \to \infty$, $f(x) \to$ _____.



21. $f(x) = x(x^2 + 4)$ ~ x^3

$x^2 + 4 = 0$

$-4 \quad -4$

$\sqrt{x^2} = \sqrt{-4}$

$x = \pm 2i$

Roots, including multiplicity:

0 / 2i / -2i

pass / no touchy!

Degree of function: 3

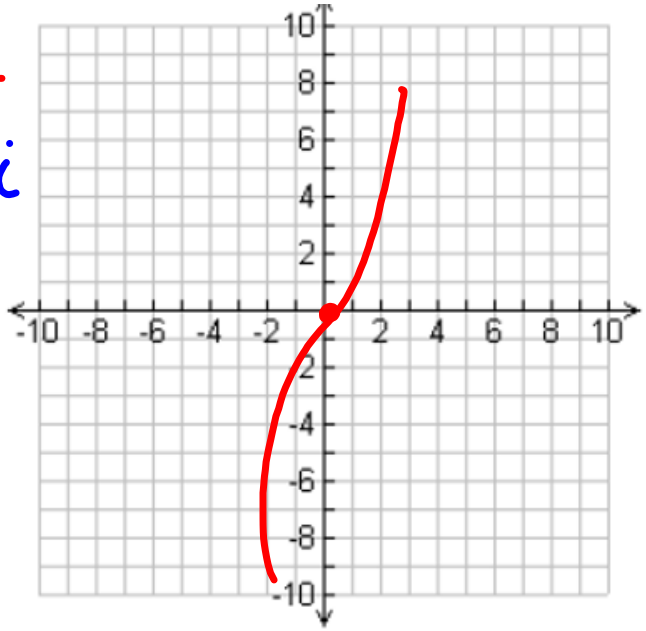
Degree: (circle) odd or even

Leading coefficient: positive or negative

End Behavior:

As $x \to -\infty, f(x) \to$ $-\infty$.

As $x \to \infty, f(x) \to$ ∞.



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

$(x+0)^2$ (bounce/pass)

Roots, including multiplicity:

0 / 3

bounce / pass

Degree of function: 5 ~ x^5

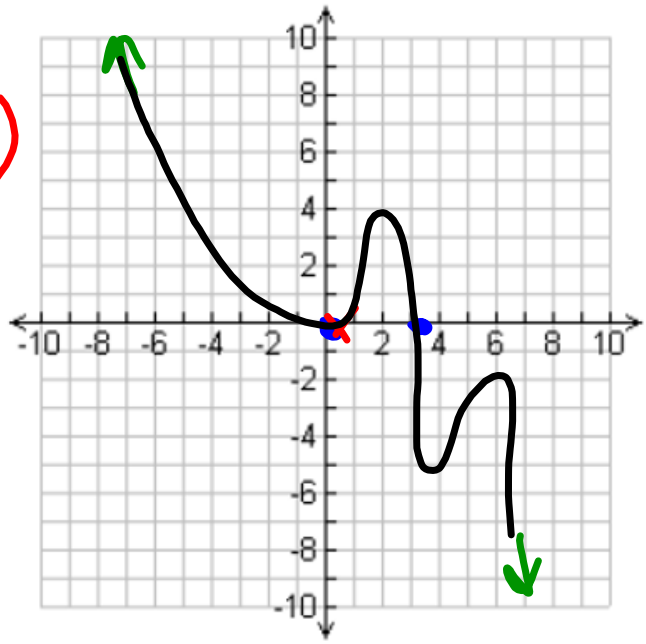
Degree: (circle) odd or even

Leading coefficient: positive or negative

End Behavior:

As $x \to -\infty, f(x) \to$ ∞.

As $x \to \infty, f(x) \to$ $-\infty$.



Secondary Math III
Module 3 PRACTICE TEST
Polynomials

Directions: Show all work.

Identify the following functions as linear, exponential, quadratic, cubic, quartic or logarithmic.

1. Quad

x	Y
0	2
1	5
2	14
3	29
4	50

3, 9, 15, 21 → 6, 6, 6 → x^2

2. linear

x	y
0	9
1	10
2	11
3	12

1, 1, 1

3. Cubic

x	y
0	2
1	3
2	10
3	29
4	66

1, 7, 19, 37 → 6, 12, 18 → 6 → x^3

Use the equations below to answer questions 4-7.

$f(x) = x + 2$ $\quad g(x) = x^2 + 3$ $\quad h(x) = x^3 + 4$

4. Find $f(x) + g(x)$

$(x+2) + (x^2+3)$

$x+2 \quad +x^2+3$

$x^2 + x + 5$

5. Find $g(x) - f(x)$

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

$x+2 - x^2 - 3$

$-x^2 + x - 1$

6. Find $f(x) \cdot g(x)$

$(x+2)(x^2+3)$

$x^3 + 3x + 2x^2 + 6$

$x^3 + 2x^2 + 3x + 6$

7. Find $f(x)[h(x) + g(x)]$

$(x+2)[x^3+4+x^2+3]$

$(x+2)[x^3+x^2+7]$

$x^4 + x^3 + 7x + 2x^3 + 2x^2 + 14$

$x^4 + 3x^3 + 2x^2 + 7x + 14$

Solve for x in questions 8-10.

8. $(x-1)(x+5)(x+2) = 0$

1, -5, -2

9. $x^2 - 2x - 15 = 0$

$(x-5)(x+3)$ $\quad -5 \times 3 = -15$, $-5 + 3 = -2$

$x = 5, -3$

10. $4x^2 - 36 = 0$

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

$(2x-6)(2x+6) = 0$

$+6 \quad +6$

$\frac{2x}{2} = \frac{-6}{2}$

$x = -3$

For 11-12: Use the Remainder Theorem to determine if the following are roots of the given polynomial; State the remainder and YES OR NO, it is a root/factor.

11. $(n^3 - 2n^2 + 9n - 18); f(2)$

$(2)^3 - 2(2)^2 + 9(2) - 18 = 0?$

$8 - 8 + 18 - 18 = 0 \quad 0 = 0$ ✓

yes!

12. $(x^3 - 19x - 30) \div (x + 3)$.

-3

$(-3)^3 - 19(-3) - 30 = 0?$

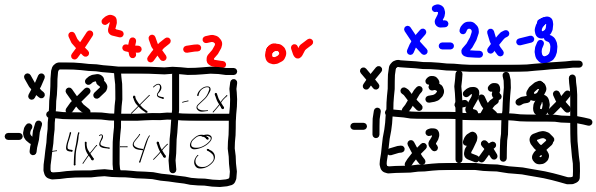
$-27 + 57 - 30 = 0 \quad 0 = 0$ ✓

yes!

For 13-14: Write a polynomial for the given information in Factored Form AND Standard Form:

13. Given: leading coefficient of -3, and the following roots: 1, -2, and 4

Factored: $-3(x-1)(x+2)(x-4)$



$-3(x^3-3x^2-6x+8)$ x^3-3x^2-6x+8

same

doesn't matter which ones you multiply first. Same result.

Standard: $-3x^3+9x^2+18x-24$

14. Given: leading coefficient of 2, and the following roots: 3, 5i, and $-5i$

Factored: $2(x-3)(x-5i)(x+5i)$

$x^2+5xi-5xi-25i^2$ (-1)

$(x-3)(x^2+25)$

$2(x^3-3x^2+25x-75)$

Standard: $2x^3-6x^2+50x-150$

For 15-16: Divide the following polynomials to factor COMPLETELY, state ALL roots.

15. $x+3 \overline{)\, x^3+3x^2-4x-12}$

$-x^3-3x^2$

$-4x-12$

$+4x+12$

0

-4

$2 \quad -2$

0

or

$x^2-4=0$

$+4 \quad +4$

$\sqrt{x^2}=\sqrt{4}=\pm 2$

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

X= -3, -2, 2

16. $x-1 \overline{)\, x^3-x^2+5x-5}$

x^2+5

$-x^3+x^2$

$5x-5$

$-5x+5$

0

$x^2+5=0$

$-5 \quad -5$

$\sqrt{x^2}=\sqrt{-5}$

$x=\pm\sqrt{5}i$

$(x-1)$

X= 1, $\sqrt{5}i$, $\sqrt{5}i$

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

Roots, including multiplicity:

-2, 1, 4 all pass

Degree of function: 3

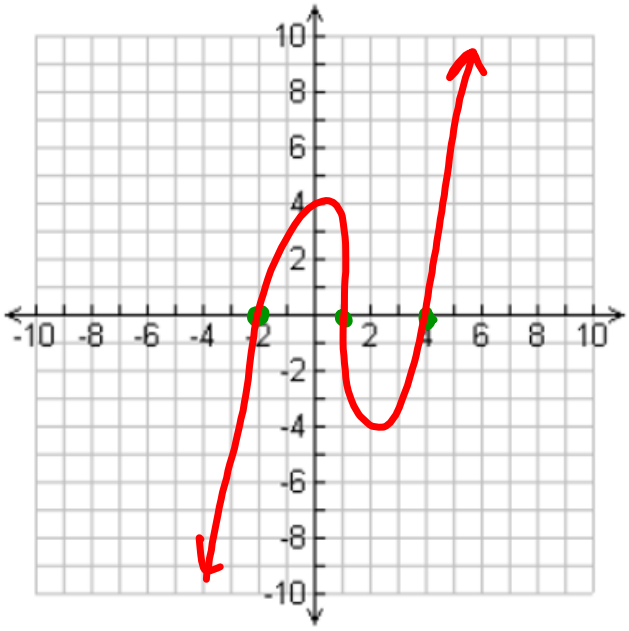
Degree: (circle) odd or even

Leading coefficient: positive or negative

End Behavior:

As $x \to -\infty, f(x) \to$ $-\infty$.

As $x \to \infty, f(x) \to$ ∞.



neg.

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

Roots, including multiplicity:

-1, -4, 3 all pass all odd exponents

Degree of function: 5

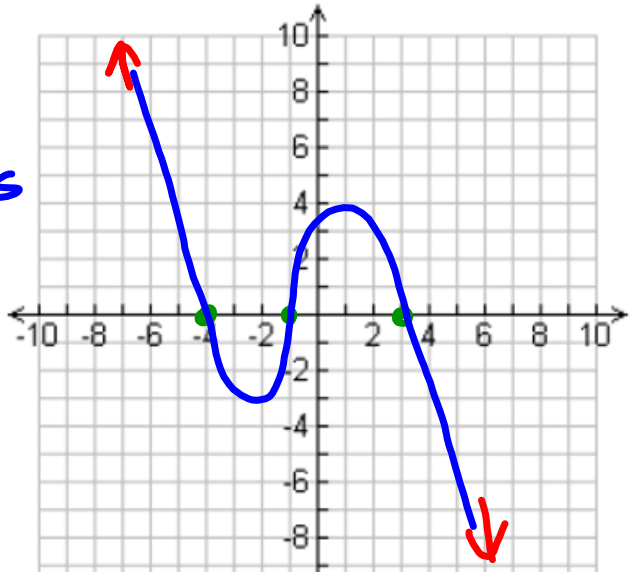
Degree: (circle) odd or even

Leading coefficient: positive or negative

End Behavior:

As $x \to -\infty, f(x) \to$ ∞.

As $x \to \infty, f(x) \to$ $-\infty$.



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

Roots, including multiplicity:

0, -3, 4
pass, bounce, pass

Degree of function: 4 ~x^4

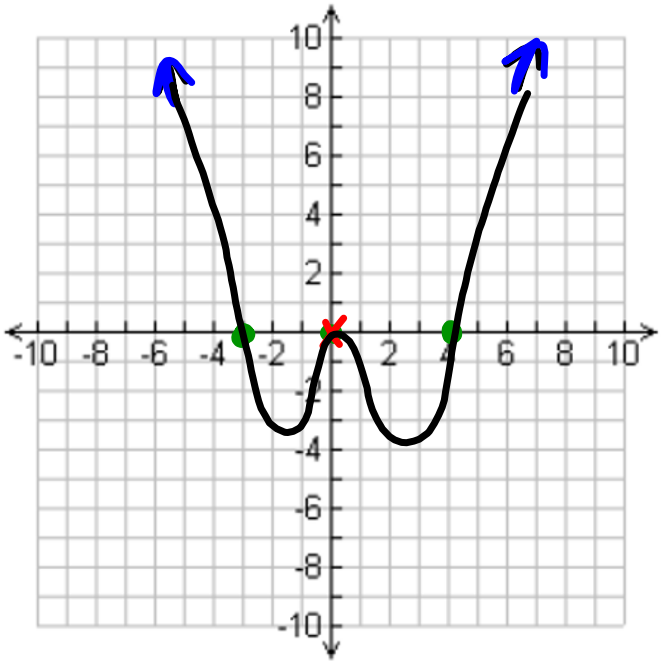
Degree: (circle) odd or even

Leading coefficient: positive or negative

End Behavior:

As $x \to -\infty, f(x) \to \infty$.

As $x \to \infty, f(x) \to \infty$.



20. $f(x) = (x+2)(x^2+9)$ → $x^2+9=0$, $-9\ -9$, $\sqrt{x^2}=\sqrt{-9}$, $x=\pm 3i$

-2

Roots, including multiplicity:

-2, 3i, -3i
pass, no touchy!

Degree of function: 3

Degree: (circle) odd or even

Leading coefficient: positive or negative

End Behavior:

As $x \to -\infty, f(x) \to -\infty$.

As $x \to \infty, f(x) \to \infty$.