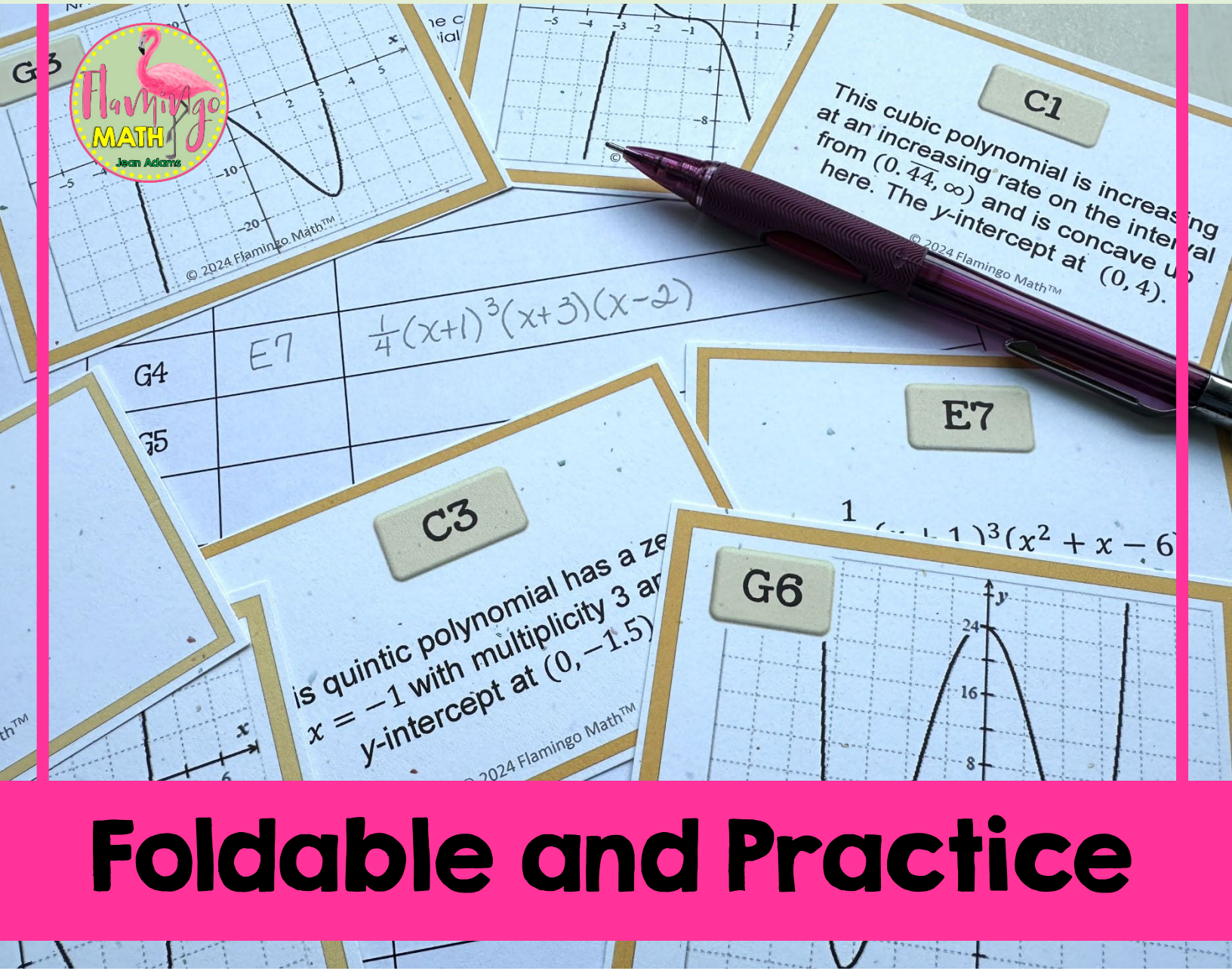
Polynomial Functions
Foldable & Task Cards



Foldable and Practice

Polynomial Functions and Zeros

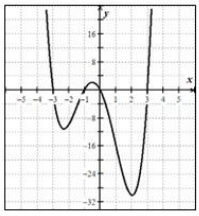
Key Concepts

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

- ❑ (x-a) is a linear factor of the polynomial $P(x)$
- ❑ a is a **zero** of the polynomial function $y = P(x)$
- ❑ a is a **root** (or solution) of the polynomial equation $P(x) = 0$.
- ❑ a is an **x-intercept** of the graph of $y = P(x)$

Zeros, Factors and Multiplicity

mial function $x^2 - 9x$, has e point $(-3,0)$, $(3,0)$. Write product of



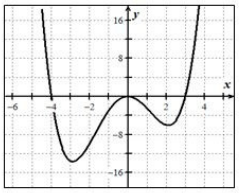
eros of $f(x) = x^3 - 4x^2 + 4x$

Multiple Zeros

If a is a zero of multiplicity n in the polynomial function $y = p(x)$, then the behavior of the graph at the x-intercept will be:
- ❑ close to linear if $n = 1$,
- ❑ Close to quadratic if $n = 2$, and
- ❑ Close to cubic if $n = 3$.

EX #3: For the polynomial function shown a right,

A. Write the function as a product of linear factors.



B. Describe the behavior of the graph at each zero and the multiplicity.

Finding Complex Zeros

If $P(x)$ is a polynomial with rational coefficients, then the irrational roots of $P(x) = 0$ occurs in conjugate pairs. That is, when $(a + \sqrt{b})$ is a root, the $(a - \sqrt{b})$ is also a root. Also, if (a + bi) is a zero of a function, then (a – bi) is also a zero.

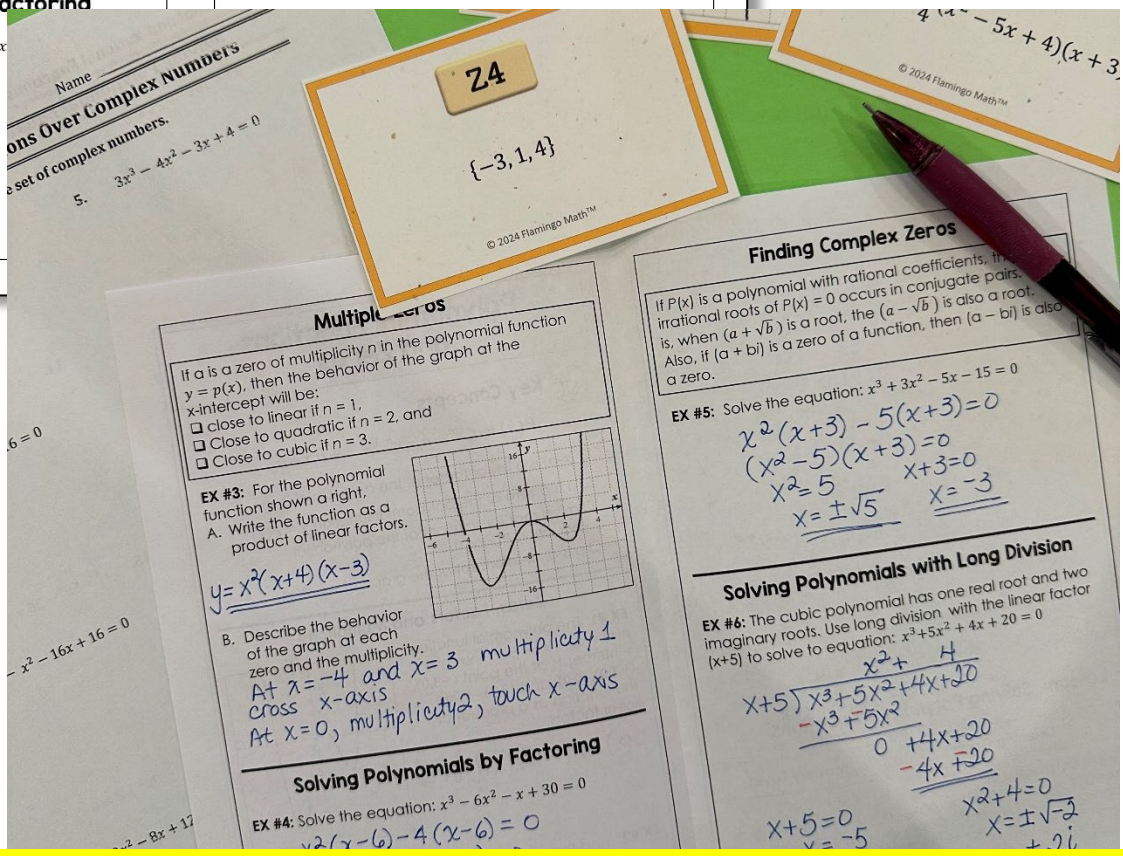
EX #5: Solve the equation: $x^3 + 3x^2 - 5x - 15 = 0$

Solving Polynomials with Long Division

EX #6: The cubic polynomial has one real root and two imaginary roots. Use long division with the linear factor (x+5) to solve to equation: $x^3 + 5x^2 + 4x + 20 = 0$

Solving Polynomials by Factoring

EX #4: Solve the equation: $x^3 - 6x^2 - 4x$



Lesson Foldable

Polynomial and Rational Functions Name _____

Solving Polynomial Equations Over Complex Numbers

Solve each polynomial equation over the set of complex numbers.

1. $x^4 - 10x^2 + 9 = 0$

2. $x^3 + 4x^2 - 4x - 16 = 0$

3. $x^3 - x^2 - 16x + 16 = 0$

4. $2x^3 - 3x^2 - 8x + 12 = 0$

5. $3x^3 - 4x^2 - 3x + 4 = 0$

6. $x^3 - 5x^2 - 9x + 45 = 0$

7. $x^4 + x^2 - 25x^2 - 25 = 0$

8.

Polynomial and Rational Functions Name _____

Solving Polynomial Equations Over Complex Numbers

9. $x^4 - 10x^2 + 25 = 0$

10. $x^4 - 4x^2 - 45 = 0$

11. $x^4 - 23x^2 - 50 = 0$

12. $x^4 - 9x^2 + 18 = 0$

13. $x^4 - 6x^2 + 9 = 0$

14. $x^3 + 3x^2 - 25x - 75 = 0$

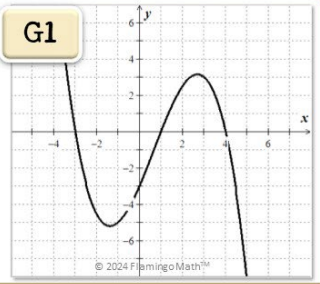
15. $x^4 + 5x^2 - 36 = 0$

16. $4x^4 - 9x^2 + 2 = 0$

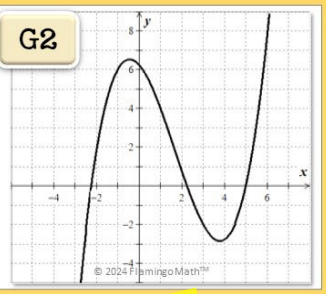
Practice Set

Graph Cards

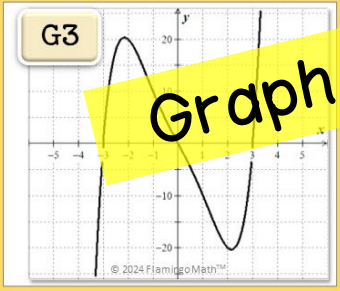
G1



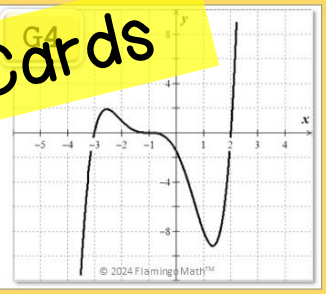
G2



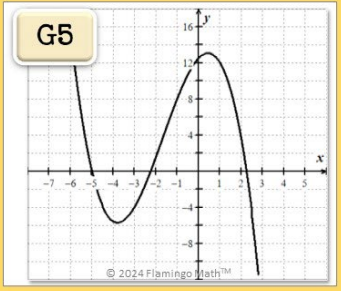
G3



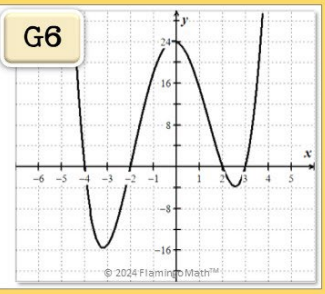
G4



G5



G6



Equation Cards

E1

$y = x^4 - 15x^2 - 16$

E2

$y = 2x^3 - 3x^2 - 8x + 12$

E3

$y = -\frac{1}{2}(x^3 + 5x^2 - 5x - 25)$

E4

$f(x) = \frac{1}{2}(x^4 - 4x^2 - 45)$

E5

$y = \frac{1}{4}x(x^4 - 5x^2 - 36)$

E6

$y = x^5 + 6x^4 + 9x^3$

E7

$y = \frac{1}{4}(x+1)^3(x^2 + x - 6)$

E8

$f(x) = -\frac{1}{4}(x^2 - 5x + 4)(x + 3)$

Zeros

Z5

$\{-3, 3, -2i, 2i\}$

Z6

$\{-3, 0\}$

Z7

$\{-4, -2, 2, 3\}$

Z8

$\{5, -\sqrt{5}, \sqrt{5}\}$

Z9

$\left\{-2, 2, \frac{3}{2}\right\}$

Z10

$\{-3, 3, -i\sqrt{5}, i\sqrt{5}\}$

Z11

Z12

Characteristics

C1

This cubic polynomial is increasing at an increasing rate on the interval from $(0.\overline{44}, \infty)$ and is concave up here. The *y*-intercept at $(0, 4)$.

C2

This quartic polynomial is an even function, with two real roots, two complex roots, and a *y*-intercept at $(0, -16)$.

C3

This quintic polynomial has a zero at $x = -1$ with multiplicity 3 and a *y*-intercept at $(0, -1.5)$

C4

This fifth-degree polynomial has one real root with multiplicity 3 and two imaginary roots.

C5

$\lim_{x \to -\infty} f(x) = \infty \quad \lim_{x \to \infty} f(x) = -\infty$

The *y*-intercept is $(0, -3)$

C6

$\lim_{x \to -\infty} f(x) = \infty \quad \lim_{x \to \infty} f(x) = \infty$

The *y*-intercept is (0, 24), and a vertical compression factor of $\frac{1}{2}$.

C7

C8

Task Card Match-Up