NAME _____ DATE _____ PERIOD _____

4.1 Polynomial Functions · Form A

xample 1

Describe the end behavior of each function using the leading coefficient and degree, and state the domain and range.

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

EB: $x \to \infty, f(x) \to -\infty$; $x \to -\infty, f(x) \to \infty$

LC: -2 **Deg:** 3

D: $(-\infty, \infty)$ **R:** $(-\infty, \infty)$

2. $f(x) = \frac{3}{4}x^6$

EB: $x \to \infty, f(x) \to \infty$; $x \to -\infty, f(x) \to \infty$

LC: $3/4$ **Deg:** 6

D: $(-\infty, \infty)$ **R:** $[0, \infty)$

Example 2

3. **MACHINE EFFICIENCY** company uses the function $f(x) = x^3 + 3x^2 - 18x - 40$ to model the change in efficiency of a machine based on its position x. Graph the function (on attached graph paper) and state the domain and range. D: $(-\infty, \infty)$ R: $(-\infty, \infty)$

Example 3

State the degree and leading coefficient of each polynomial in one variable. If it is not a polynomial in one variable, explain why.

4. $(2x - 1)(4x^2 + 3)$ D: 3 ; LC: 8

5. $18 - 3y + 5y^2 - y^5 + 7y^6$ D: 6 ; LC 7

6. $2r - r^2 + \frac{1}{r^2}$ not a poly. in one variable. negative exponent (variable in denominator)

Example 4

7. **DRILLING** The volume of a drill bit can be estimated by the formula for a cone, $V = \frac{1}{3}\pi hr^2$, where h is the height of the bit and r is its radius. Substituting $\frac{\sqrt{3}}{3}r$ for h, the volume of the drill bit can be estimated by $V = \frac{\sqrt{3}}{9}\pi r^3$.

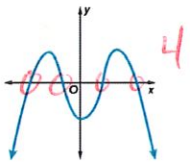
a. What is the volume of a drill bit with a radius of 3 centimeters? $3\pi\sqrt{3}$

b. Sketch a graph (on attached graph paper) of the function .

Example 5

Use the graph to state the number of real zeros of the function.

8.



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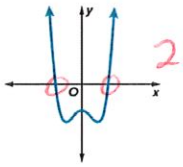
9.



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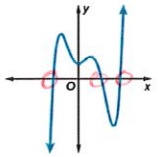
10.



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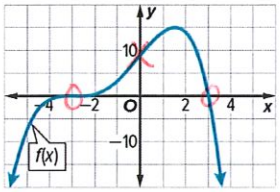
Example 6

11. Examine the graph of $f(x)$ and $g(x)$ shown in the table.



x	−5	−3	0	1.5	3
g(x)	7.5	0	−9	−15	0

a. Which function has the greater relative maximum? $f(x)$

b. Compare the zeros, x- and y-intercepts, and end behavior of $f(x)$ and $g(x)$.

zeros: $f(x) = -3, 3$ $g(x) = -3, 3$

y-int: $f(x) = 9$, $g(x) = -9$

end behav.

$f(x)$: $x \to \infty, f(x) \to -\infty$; $x \to -\infty, f(x) \to -\infty$

$g(x)$: $x \to \infty, g(x) \to \infty$; $x \to -\infty, g(x) \to \infty$

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Mixed Exercises

Describe the end behavior, state the degree and leading coefficient of each polynomial. If the function is not a polynomial, explain why.

12. $g(x) = 2x^5 + 6x^4$

EB: $x \to \infty, g(x) \to \infty; x \to -\infty, g(x) \to \infty$

LC: 2 **Deg:** 5

13. $h(x) = 9x^6 - 5x^7 + 3x^2$

EB: $x \to \infty, h(x) \to -\infty; x \to -\infty, h(x) \to \infty$

LC: 9 **Deg:** 6

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

EB: $x \to \infty, f(x) \to -\infty; x \to -\infty, f(x) \to -\infty$

LC: −6 **Deg:** 2

15. $g(x) = 3x^7 - 4x^4 + \frac{3}{x}$

EB: not a poly in one variable

LC: **Deg:**

16. CONSTRUCT ARGUMENTS Explain why a polynomial function with an odd degree must have at least one real zero. end behavior on one end goes to ∞ & on the other goes to $-\infty$, so it must cross x-axis at least once.

17. COMPARING Compare the end behavior of the functions $g(x) = -3x^4 + 15x^3 - 12x^2 + 3x + 20$ and $h(x) = -3x^4 - 16x - 1$. Explain your reasoning. same degree is even & leading coefficient is negative.

18. ANALYZE Compare the functions g(x) and f(x). Determine which function has the potential for more real zeros and the degree of each function.

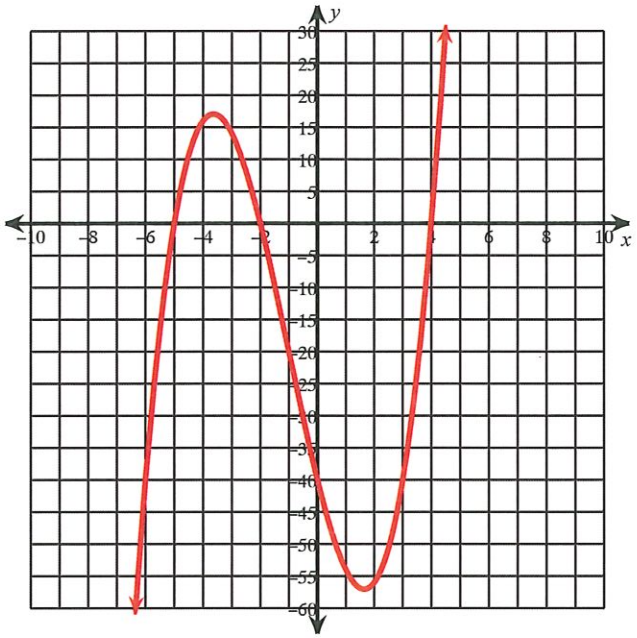
$g(x) = x^4 + x^3 - 13x^2 + x + 4$

x	−24	−18	−12	−6	0	6	12	18	24
f(x)	−8	−1	3	−2	4	7	−1	−8	5

19. CREATE Sketch the graph of an even-degree polynomial with 7 real zeros, one of which is a double zero, and the leading coefficient is negative.

4.1 Polynomial Functions - Graphs Name_____

3)



4)

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