

Unit 2 → Test Review Materials ODD

SECTION 2.1 EXERCISES

Determine which are polynomial functions. For those that are, state the degree and leading coefficient. For those that are not, explain why not.

- 1) $f(x) = 3x^{-5} + 17$ 2) $k(x) = 4x - 5x^2$ 3) $f(x) = 2x^5 - \frac{1}{2}x + 9$ 4) $f(x) = 13$ 5) $h(x) = \sqrt[3]{27x^3 + 8x^6}$

no

neg. exponent

yes
deg = 5
l.c. = 2

no
 $\sqrt[3]{\quad}$

Write a linear function that satisfies all of the following conditions:

- 6) $f(-5) = -1$ and $f(2) = 4$ 7) $f(-3) = 5$ and $f(6) = -2$ 8) $f(-4) = 6$ and $f(-1) = 2$

$(-3, 5)$ $(6, -2)$

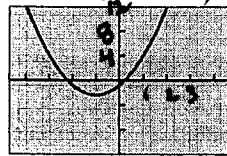
$m = \frac{-2 - 5}{6 - (-3)} = \frac{-7}{9}$

$y - 5 = -\frac{7}{9}(x + 3)$ OR $y + 2 = -\frac{7}{9}(x - 6)$ OR $y = -\frac{7}{9}x + \frac{8}{3}$

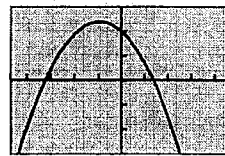
Match the graph to the function:

- A 9) $f(x) = 2(x + 1)^2 - 3$ D 12) $f(x) = 3(x + 2)^2 - 7$
B 10) $f(x) = 4 - 3(x - 1)^2$ F 13) $f(x) = 12 - 2(x - 1)^2$
E 11) $f(x) = 2(x - 1)^2 - 3$ C 14) $f(x) = 12 - 2(x + 1)^2$

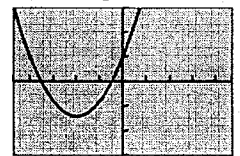
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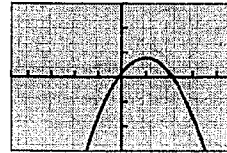
(a)



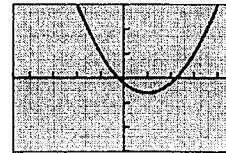
(c)



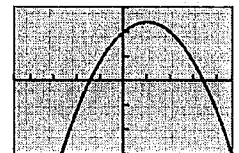
(d)



(b)



(e)



(f)

Describe how to transform the squaring function to the given function.

- 15) $g(x) = (x - 3)^2 - 2$ 16) $h(x) = \frac{1}{4}x^2 - 1$ 17) $g(x) = \frac{1}{2}(x + 2)^2$ 18) $h(x) = -3x^2 + 2$

right 3
down 2

left 2
vert. shrink $\times \frac{1}{2}$

Use Completing the square to write each of the following in vertex form, then state the vertex:

- 19) $f(x) = x^2 - 4x + 6$ 20) $g(x) = x^2 - 6x + 12$ 21) $f(x) = 10 - 16x - x^2$ 22) $h(x) = 8 + 2x - x^2$ 23) $f(x) = 2x^2 + 6x + 7$

$f(x) = x^2 - 4x + \underline{4} + \underline{6} - \underline{4}$

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

$(2, 2)$

24) $g(x) = 5x^2 - 25x + 12$

$f(x) = -(x^2 + 16x + \underline{64}) + \underline{10} + \underline{64}$

$f(x) = -(x + 8)^2 + 74$

$(-8, 74)$

$f(x) = 2(x^2 + 3x + \frac{9}{4}) + 7 - \frac{9}{2}$

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

$(-\frac{3}{2}, \frac{5}{2})$

Write an equation for the quadratic function with the given vertex & point.

- 25) Vertex $(1, 3)$, point $(0, 5)$

$y = a(x - h)^2 + k$

$5 = a(0 - 1)^2 + 3$

$5 = a + 3$

$2 = a$

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

- 26) Vertex $(-2, -5)$, point $(-4, -27)$

2.2 Power functions

Express the following functions as a power function in exponential form analyze and also graph the functions by hand. **ONLY** use the calculator to **confirm** your graph.

ODDS general graph properties (D,R)

1) $f(x) = \sqrt{x} = x^{1/2}$ D: $[0, \infty)$
R: $(-\infty, \infty)$

2) $f(x) = \sqrt[6]{x^5}$

3) $f(x) = \sqrt[3]{x} = x^{1/3}$ D: $(-\infty, \infty)$
R: $(-\infty, \infty)$
ODD

4) $g(x) = \sqrt[3]{x^2}$

5) $g(x) = \sqrt[5]{x^9} = x^{9/5}$ D: $(-\infty, \infty)$
R: $(-\infty, \infty)$
ODD

6) $f(x) = \sqrt[3]{x^4}$

7) $f(x) = \sqrt{x^2} = x^{2/5}$ D: $(-\infty, \infty)$
R: $[0, \infty)$
EVEN

8) $f(x) = \sqrt[8]{x^5}$

9) $f(x) = \sqrt{x^3} = x^{3/5}$ D: $(-\infty, \infty)$
R: $(-\infty, \infty)$
ODD

10) $g(x) = \frac{1}{\sqrt{x}}$

11) $g(x) = \frac{1}{\sqrt[3]{x^4}} = \frac{1}{x^{4/3}} = x^{-4/3}$ D: $(-\infty, 0) \cup (0, \infty)$
R: $(0, \infty)$
EVEN

12) $g(x) = \frac{1}{\sqrt[5]{x^2}}$

13) $h(x) = \frac{1}{\sqrt[3]{x}} = \frac{1}{x^{1/3}} = x^{-1/3}$ D: $(-\infty, 0) \cup (0, \infty)$
R: $(-\infty, 0) \cup (0, \infty)$
ODD

14) $k(x) = \frac{1}{\sqrt[3]{x^2}}$

15) ~~$g(x) = \sqrt{|x-4|}$~~ $f(x) = \sqrt[3]{|x+3|}$

Pre-Calculus: 2.3 – 2.5 Review

Name: _____ Date _____ Period _____

Understand the following theorems and how to apply them:

- Remainder Theorem
 - Factor Theorem
 - Fundamental Theorem of Algebra
 - Complex Conjugate Theorem
- Study and practice the challenges from your notes, quizzes, and OoCLs.

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Graph the function in a viewing window that shows all of its extrema and x-intercepts. Describe the end behavior using limits.

19. $f(x) = -x^3 + 4x^2 + 31x - 70$

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

Find the zeroes of the function algebraically.

33) $f(x) = x^2 + 2x - 8$
 $(x + 4)(x - 2) = 0$
 $x + 4 = 0 \quad x - 2 = 0$
 $x = -4, x = 2$

35. $f(x) = 9x^2 - 3x - 2$
 $(3x - 2)(3x + 1) = 0$
 $3x - 2 = 0 \quad 3x + 1 = 0$
 $x = 2/3, x = -1/3$

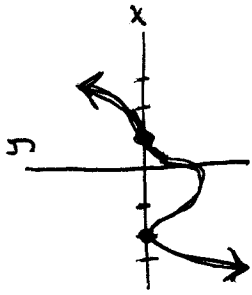
37) $f(x) = 3x^3 - x^2 - 2x$
 $x(3x^2 - x - 2) = 0$
 $x(3x + 2)(x - 1) = 0$
 $x = 0, 3x + 2 = 0, x - 1 = 0$
 $x = -2/3, x = 1$

Determine the degree and list the zeroes, including multiplicity, of the polynomial function, and then sketch the graph.

41) $f(x) = (x - 1)^3(x + 2)^2$ degree = 5

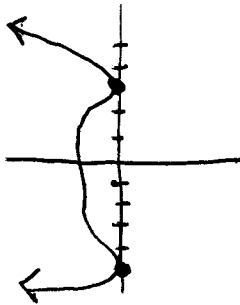
zeros: $x = 1$ mult. 3
 $x = -2$ mult. 2

positive l.c.!!!



42) $f(x) = 7(x - 3)^2(x + 5)^4$ degree = 6

zeros: $x = 3$ mult. 2
 $x = -5$ mult. 4



Use algebra to determine a cubic function with the given zeroes.

53. $x = 3, x = -4, x = 6$

55. $x = \sqrt{3}, x = -\sqrt{3}, x = 4$

Using only algebraic methods, find the cubic function represented by the given table of values.

31.

x	-4	0	3	5
$f(x)$	0	180	0	0

55. $f(x) = 2x^4 - 7x^3 - 2x^2 - 7x - 4 = (2x+1)(x-4)(x-i)(x+i)$
 possible zeros: $\pm 1, \pm 2, \pm 4, \pm \frac{1}{2}$

41

	2	-7	-2	-7	-4
\downarrow	8	4	8	4	
	2	1	2	1	0

$2x^3 + x^2 + 2x + 1 = 0$

$x^2(2x+1) + 1(2x+1) = 0$
 $(2x+1)(x^2+1) = 0$
 $2x+1 = 0 \implies x = -\frac{1}{2}$
 $x^2+1 = 0 \implies x^2 = -1$
 rational $x = -\frac{1}{2}$
 60. Find the remainder when $x^6 - 17$ is divided by $x-1$.

Find all the real zeros of the function, finding exact values whenever possible. Identify each zero as rational or irrational. Then show the full linear factorization of each polynomial.

54. $f(x) = x^4 - x^3 - 7x^2 + 5x + 10$

possible zeros: $\pm 1, \pm 2, \pm 5, \pm 10$

41

	1	-1	-7	5	10
\downarrow	-1	2	+5	-10	
	1	-2	-5	10	0

$x^3 - 2x^2 - 5x + 10 = 0$

$x^2(x-2) - 5(x-2) = 0$
 $(x-2)(x^2-5) = 0$

$x-2 = 0 \implies x^2 - 5 = 0$

$x = 2$ rational
 $x^2 = 5 \implies x = \pm\sqrt{5}$ both irrational

$f(x) = (x+1)(x-2)(x-\sqrt{5})(x+\sqrt{5})$

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 Divide $f(x)$ by $d(x)$ and write a summary statement in polynomial form.

26. $f(x) = x^4 + 3x^3 + x^2 - 3x + 3; d(x) = x + 2$

27. $f(x) = 2x^4 - 3x^3 + 9x^2 - 14x + 7$; $d(x) = x^2 + 4$

Perform the indicated operation and write the result in the form $a + bi$.

39. $(1 + i)^3$

41. i^{29}

Use the remainder Theorem to find the remainder when $f(x)$ is divided by $x - k$ and then check by synthetic division.

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

43. Solve for x . $x^2 - 6x + 13 = 0$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(13)}}{2(1)} = \frac{6 \pm \sqrt{-16}}{2}$$

$$= \frac{6 \pm 4i}{2} = \boxed{3 \pm 2i}$$

Find all the zeroes and write a linear factorization of the function.

54. $f(x) = 5x^3 - 24x^2 + x + 12$

possible zeros: $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12,$
 $\pm \frac{1}{5}, \pm \frac{2}{5}, \pm \frac{3}{5}, \pm 4, \pm 6, \pm 12$
 $\pm \frac{4}{5}, \pm \frac{6}{5}, \pm \frac{12}{5}$

31. $x - 2$; $x^3 - 4x^2 + 8x - 8$

$$\begin{array}{r|rrrr} 5 & 5 & -24 & 1 & 12 \\ & & 4 & -16 & -12 \\ \hline & 5 & -20 & -15 & 0 \end{array}$$

lin. factorization: $5x^2 - 20x - 15 = 0$
 $(x - \frac{4}{5})(x - (2 + \sqrt{7}))(x - (2 - \sqrt{7}))$
 $a = 1, b = -4, c = -3$

$$\frac{4 \pm 2\sqrt{7}}{2} = 2 \pm \sqrt{7}$$

$$= (5x - 4)(x - 2 - \sqrt{7})(x - 2 + \sqrt{7})$$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-3)}}{2(1)} = \frac{4 \pm \sqrt{28}}{2}$$