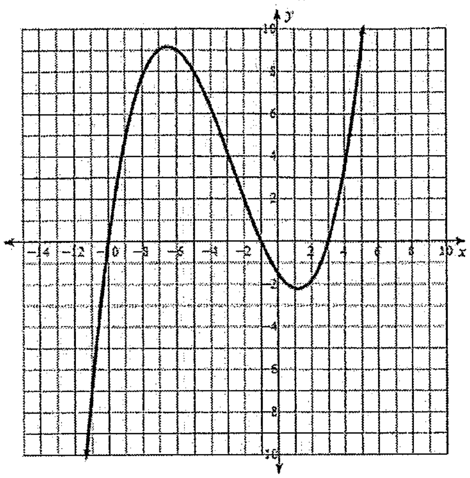
Name ______________________ Period ________

6.3A Using Graphs to Find Solutions of Cubic Equations

1. Use the graph to find the zeros of each function.

a)

Graph:



Real zeros:

$x = -10, -1, 3$

Factor(s) that create the zeros:

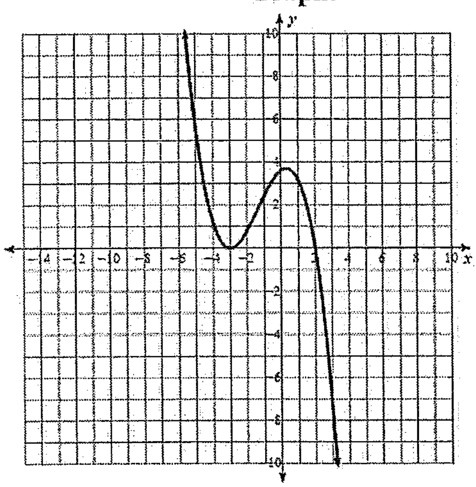
$(x+10)(x+1)(x-3)$

Possible equation of the curve to the left:

$y = x^3 + 8x^2 - 23x - 33$

b)

Graph:



Real zeros:

$x = -3, 2$

Double Root

Factor(s) that create the zeros:

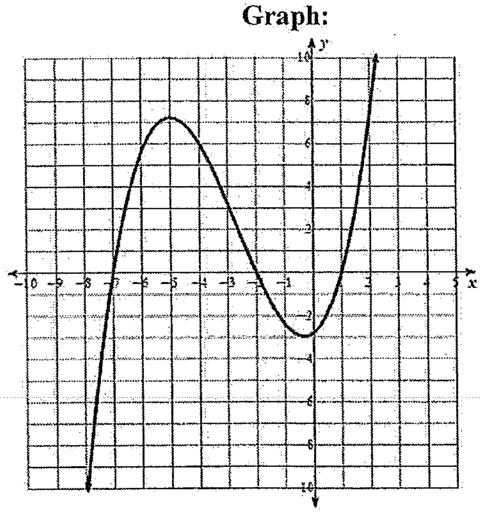
$(x+3)(x+3)(x-2)$

Possible equation of the curve to the left:

$y = -x^3 - 4x^2 + 3x + 18$

c)

Graph:



Real zeros:

$x = -7, -2, 1$

Factor(s) that create the zeros:

$(x+7)(x+2)(x-1)$

Possible equation of the curve to the left:

$y = x^3 + 8x^2 + 5x - 14$

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6.3A *Using Graphs to Find Solutions of Cubic Equations*

2. Using a graphing utility, use the table of values and/or the graph to find the x-intercepts. If necessary, round your answers to the nearest thousandth.

a) $y = x^3 - 8x^2 + 19x - 12$

(1, 0)
(3, 0)
(4, 0)

b) $y = x^3 + 2x^2 - 12x + 10$

(−4.879, 0)
(1.287, 0)
(1.592, 0)

c) $g(x) = x^3 - 14x^2 + 47x - 18$

(0.438, 0)
(4.562, 0)
(9, 0)

d) $h(x) = x^3 + x^2 + 2x + 24$

(−3, 0)

3. Using a graphing utility, use the table of values and/or the graph to find the solutions to the equation $f(x) = 0$.

a) $f(x) = 3x^3 - 7x^2 + 8x - 2$

$x = \frac{1}{3}$

b) $f(x) = -4x^3 - 7x^2 + 4x + 3$

$x = -2.059, -0.469$, or 0.777

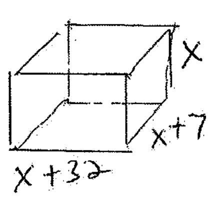
c) $f(x) = -x^3 + 2x^2 + 5x - 6$

$x = -2, 1$, or 3

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

$x = -1$ or 2

4. You are designing a swimming pool with a volume of 4800ft³. The width of the pool should be 7 feet more than the depth, and the length should be 32 more feet than the depth. What should the dimensions of the pool be? (draw a sketch of the situation)



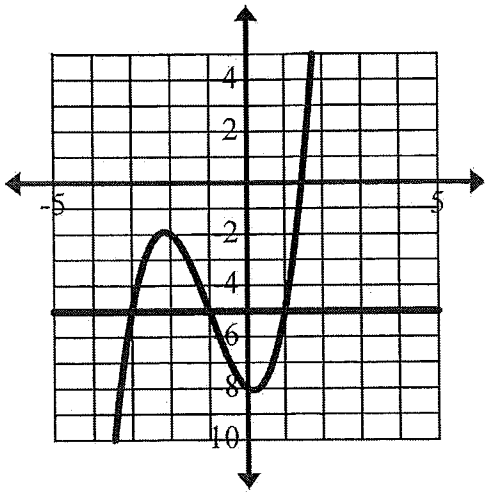
$x(x+7)(x+32) = 4800$
$x(x^2 + 39x + 224)$
$x^3 + 39x^2 + 224x - 4800 = 0$
$x = 8$, so
height = 8 ft
width = 15 ft
length = 40 ft

Name ______________________________ Period __________

6.3B *Finding Real Solutions of Polynomial Equations Graphically*

#2 – 4: Find the solution for each problem. Verify that each answer truly is a solution.

2. $x^3 + 3x^2 - x - 8 = -5$ Proposed Solution(s): $x = -3, -1, 1$



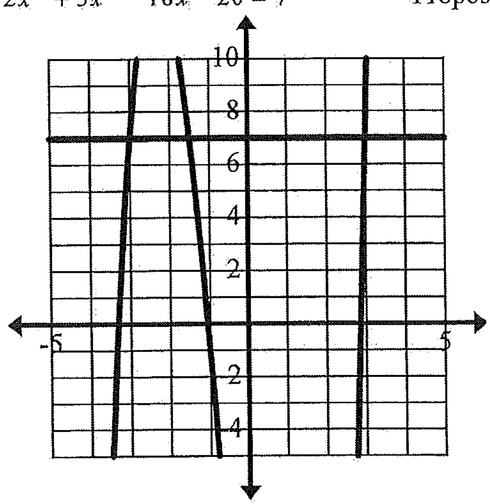
✓ Verify your solution(s):

$(-3)^3 + 3(-3)^2 - (-3) - 8 =$
$-27 + 3(9) + 3 - 8 =$
$-27 + 27 + 3 - 8$
$-5 = -5$ ✓

$(-1)^3 + 3(-1)^2 - (-1) - 8$
$-1 + 3(1) + 1 - 8$
$3 - 8 = -5$ ✓

$(1)^3 + 3(1)^2 - (1) - 8 = -5$ ✓
$1 + 3 - 1 - 8$

3. $2x^3 + 3x^2 - 18x - 20 = 7$ Proposed Solution(s): $x = -3, -1.5, 3$



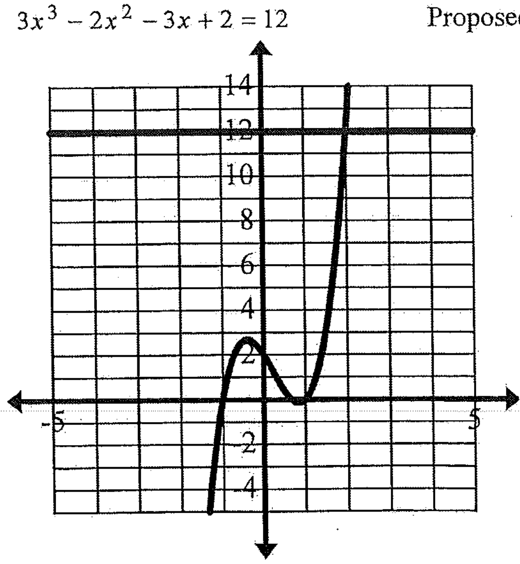
✓ Verify your solution(s):

$2(-3)^3 + 3(-3)^2 - 18(-3) - 20 =$
$2(-27) + 3(9) + 54 - 20$
$-54 + 27 + 54 - 20 = 7$ ✓

$2(-1.5)^3 + 3(-1.5)^2 - 18(-1.5) - 20 =$
$-6.75 + 6.75 + 27 - 20 = 7$
$7 = 7$ ✓

$2(3)^3 + 3(3)^2 - 18(3) - 20 =$
$54 + 27 - 54 - 20 =$
$7 = 7$ ✓

4. $3x^3 - 2x^2 - 3x + 2 = 12$ Proposed Solution(s): $x = 2$



✓ Verify your solution(s):

$3(2)^3 - 2(2)^2 - 3(2) + 2 =$
$3(8) - 2(4) - 6 + 2$
$24 - 8 - 6 + 2$
$26 - 14 = 12$ ✓

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6.3B *Finding Real Solutions of Polynomial Equations Graphically*

6. Find the solution(s) to each equation by graphing.

a) $x^4 - x^3 + 6.5x^2 + 13x - 8 = 20$

$x = -2.067$ or 1.284

b) $x^5 - x^4 + x^3 - 2x^2 - 11x + 12 = 10$

$x = -1.446$, 0.177, or 2.086

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

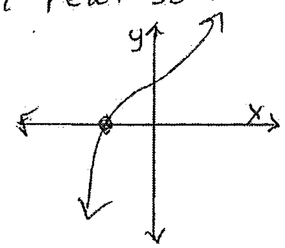
$x = -4.511, 0, 0.759, 1.753$

d) $(x+1)(x+4)(x-7)(x+6) = 25$

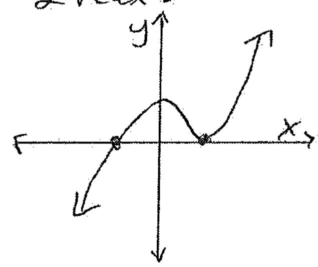
$x = -6.169, -3.623, -1.230, 7.022$

7. Considering the general shape of a cubic function, how many solutions can a cubic equation have? Explain your answer clearly and give an example of each.

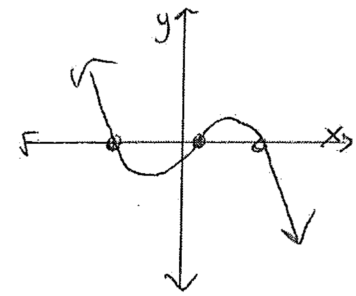
1 real solution



2 real solutions

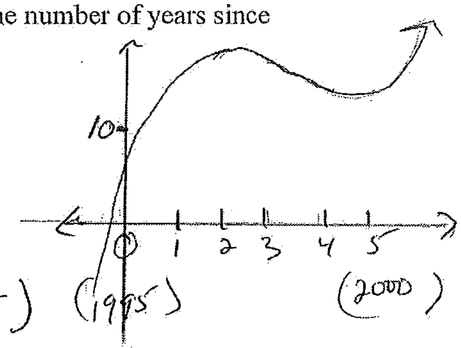


3 real solutions



8. The average amount of bananas (in pounds) eaten per person each year in the United States from 1995 to 2000 can be modeled by $f(x) = 0.298x^3 - 2.73x^2 + 7.05x + 8.45$ where x is the number of years since 1995.

a) Graph the function using a graphing calculator and sketch the graph.



b) In what year did the average number of pounds first reach 14?

In the year 1996 (1.7 years after 1995)

c) When was the average number of pounds equal to 13.5? Explain your thinking.

At 3 different times, the maximum # of solutions for a cubic.

When $x = 1.2 \Rightarrow$ In the year 1996

When $x = 2.7 \Rightarrow$ In the year 1997

When $x = 5.3 \Rightarrow$ In the year 2000