Unit 6 Review – Cubic Functions and Polynomials

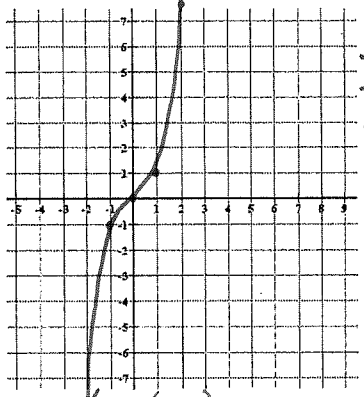
Name _____

Hour 1 2 3 4 5

LT6.1 Graphing Cubic Functions

Problems 1-6: Make a graph and make a table below the graph. Find the x-intercepts.

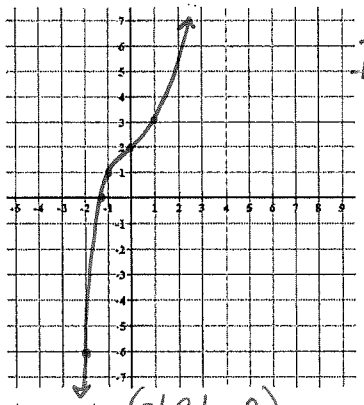
1. $y = x^3$



x	y
-2	-8
-1	-1
0	0
1	1
2	8

x-intercepts: (0,0)

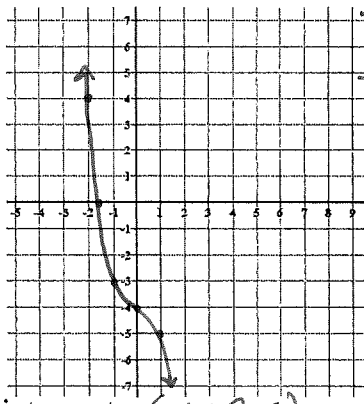
2. $y = x^3 + 2$



x	y
-2	-6
-1.26	0
-1	1
0	2
1	3

x-intercepts: (-1.26, 0)

3. $y = -x^3 - 4$



x	y
-2	4
-1.59	0
-1	-3
0	-4
1	-5

x-intercepts: (-1.59, 0)

4. Identify the following significant features of the graph of a cubic function.

Domain ℝ

Range ℝ

Relative Maximum (estimate) (0, 16)

Relative Minimum (estimate) (-4, -1.1)

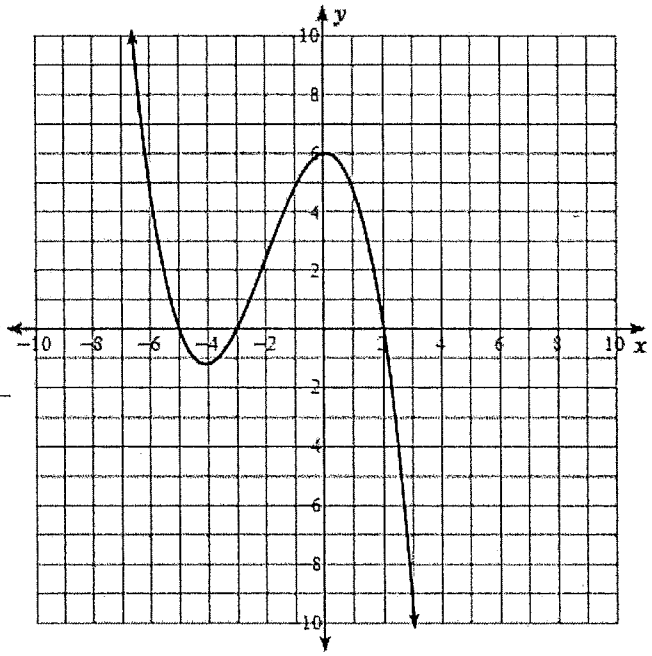
Increasing Interval(s) (estimate) $-4 < x < 0$

Decreasing Interval(s) (estimate) $-\infty < x < -4$ and $0 < x < \infty$

x-intercept (-5,0) (-3,0) (2,0)

y-intercept (0, 16)

End Behavior: as $x \to -\infty, f(x) \to \infty$; as $x \to +\infty, f(x) \to -\infty$



LT 6.2 Operations with Polynomials

Problems 5-7: Simplify the Expression.

5. $x^3 \cdot (x^2)^3$

x^9

6. $\left(\frac{6a^3b^5}{2a^2b^4}\right)^3$

$27a^3b^3$

7. $(4m^0n)^2$

$16n^2$

Problems 8-13: Add, Subtract, Multiply, or Divide the Polynomials

8. $(2x^3 + 6x^2 - x + 6) + (-4x^3 + 6x^2 + x + 18)$

$-2x^3 + 12x^2 + 24$

9. $(x^4 - 3x^3 + x - 7) - (-3x^4 + 2x^2 - x + 15)$

$4x^4 - 3x^3 - 2x^2 + 2x - 22$

10. $(x + 1)(3x + 7)(x - 7)$

$3x^3 - 11x^2 - 63x - 49$

11. $(4x^3 + x^2 + 8x)(x^2 - 8x + 13)$

$4x^5 - 31x^4 + 52x^3 - 51x^2 + 104x$

12. $\dfrac{2x^3 + 3x^2 - 29x - 60}{x^2 - 4}$

$$
\begin{array}{r}
2x + 3 \\
x^2 + 0x - 4 \;\overline{)\; 2x^3 + 3x^2 - 29x - 60} \\
-(2x^3 + 0x^2 - 8x) \\
\hline
3x^2 - 21x - 60 \\
-(3x^2 + 0x - 12) \\
\hline
-21x - 48
\end{array}
$$

$2x + 3 - \dfrac{21x - 48}{x^2 - 4}$

13. $\dfrac{x^4 + 7x^3 - 5x^2 - 4x + 8}{x + 3}$

$$
\begin{array}{r|rrrrr}
-3 & 1 & 7 & -5 & -4 & 8 \\
 & \downarrow & -3 & -12 & 51 & -141 \\
\hline
 & 1 & 4 & -17 & 47 & -133
\end{array}
$$

$x^3 + 4x^2 - 17x + 47 - \dfrac{133}{x+3}$

LT 6.3 Solving for Cubic Functions and Polynomial Equations

Problems 14-19: Solve by graphing in a graphing calculator. Round to the nearest tenth.

14. $x^3 - 8x^2 + 7x + 9 = 0$

$x \approx -0.7$
$x \approx 1.9$
$x \approx 6.8$

15. $6x^3 + 18x^2 - 2x + 3 = 7$

$x \approx -3$
$x \approx -0.5$
$x \approx 0.5$

16. $-2x^3 + 2x + 5 = 0$

$x \approx 1.6$

17. $4x^3 + 4x^2 - 39x + 36 = 0$

$x = -4$
$x \approx 1.5$

Problems 5-6: Find all zeros. Divide the function by the given factor, then solve for x.

18. $x^3 + 7x^2 - 6x - 72 = 0, \quad x + 6$

$$\begin{array}{r|rrrr} -6 & 1 & 7 & -6 & -72 \\ & \downarrow & -6 & -6 & 72 \\ \hline & 1 & 1 & -12 & 0 \end{array}$$

$x^2 + x - 12 = 0$
$(x+4)(x-3) = 0$
$x+4=0 \quad x-3=0$
$x=-4 \quad x=3$

$x=-6$
$x=-4$
$x=3$

19. $2x^3 + 13x^2 - 70x - 225 = 0, \quad 2x + 5$

$$\begin{array}{r} 1x^2 + 4x - 45 \\ 2x+5 \overline{)\,2x^3 + 13x^2 - 70x - 225} \\ -(2x^3 + 5x^2) \\ \hline 8x^2 - 70x \\ -(8x^2 + 20x) \\ \hline -90x - 225 \\ -(-90x - 225) \\ \hline 0 \end{array}$$

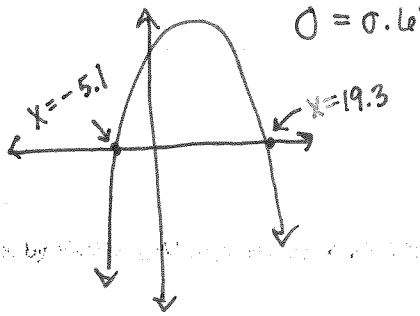
$(2x+5)(x^2+4x-45)$
$(2x+5)(x+9)(x-5)$
$2x+5=0 \quad x+9=0 \quad x-5=0$
$-5 \quad -5$
$\frac{2x}{2} = \frac{-5}{2}$

$x = -\frac{5}{2} \quad x=-9 \quad x=5$

20. A construction company is building new homes. The median cost of building these homes can be modeled by the function $C(x) = 0.6199x^4 - 55.9808x^3 + 1518.304x^2 - 8252.987x + 301070.846$, where x is the number of years since 1970. In what year was their cost at $120,000?

typo 30170.846

$120{,}000 = 0.6199x^4 - 55.9808x^3 + 1518.304x^2 - 8252.987x + 30170.846$
$-120{,}000 \qquad\qquad -120{,}000$
$0 = 0.6199x^4 - 55.9808x^3 + 1518.304x^2 - 8252.987x - 89829.154$



$1970 + 19.3 = 1989.3$

In 1989