Name: Date: Period:

Score:	First attempt due:
	Final corrections due:

Practice Worksheet:
Polynomial Long Division

Answer each question using the work shown in the box below.

1] Write the standard form of the original polynomial.

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

2] Write the factored form of the original polynomial.

$f(x) = (x+3)(x-1)(x+1)$

3] Identify all zeros of the original polynomial.

$x = -3 \quad x = 1 \quad x = -1$

4] Sketch the graph of the original polynomial.

$x^2 - 1$
$x+3 \overline{)\, x^3 + 3x^2 - x - 3}$

Find the missing information in each problem using the work shown.

5]

$x^2 + 6x + 18$
$x-4 \overline{)\, x^3 + 2x^2 - 6x + 12}$
$-(x^3 - 4x^2)$
$6x^2 - 6x + 12$
$-(6x^2 - 24x)$
$18x + 12$
$-(18x - 72)$
84

6]

$x^2 - x - 3$
$x+3 \overline{)\, x^3 + 2x^2 - 6x + 12}$
$-(x^3 + 3x^2)$
$-x^2 - 6x + 12$
$-(-x^2 - 3x)$
$-3x + 12$
$-(-3x - 9)$
21

Circle any errors in each polynomial long division and explain what the student did wrong.

7]

$$x-3 \overline{)\, x^3-8x^2+21x-18}$$

$x^2-11x+54 + \frac{-180}{x-3}$

$-(x^3-3x^2)$

$-11x^2+21x-18$

$-(-11x^2+33x)$

$54x-18$

$-(54x-162)$

-180

8]

$$x-2 \overline{)\, x^4+2x^3-x^2+3}$$

$x^3+4x^2+7x + \frac{17}{x-2}$

$-(x^4-2x^3)$

$0x$

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

$-(4x^3-8x^2)$

$7x^2+3$

$-(7x^2-14)$

17

Use long division to find the quotient. Show all work.

9] $(10x^2+19x-25) \div (x+3)$

$$x+3 \overline{)\, 10x^2+19x-25}$$

$10x-11$ R 8

$10x-11+\frac{8}{x+3}$

$-(10x^2+30x)$

$-11x-25$

$-(-11x-33)$

8

10] $(x^3-19x-30) \div (x-5)$

$$x-5 \overline{)\, x^3+0x^2-19x-30}$$

x^2+5x+6 R 0

$-(x^3-5x^2)$

$5x^2-19x$

$-(5x^2-25x)$

$6x-30$

$-(6x-30)$

0

Use long division to rewrite f(x) in factored form and find all zeros. Then sketch the graph. Show all work.

11] $f(x) = x^4 - 4x^3 - 6x^2 + 36x - 27$ has a factor of $(x-3)$ with multiplicity two.

$3 \mid 1 \; -4 \; -6 \; 36 \; -27$

$\quad\quad 3 \; -3 \; -27 \; 27$ ★

$3 \mid 1 \; -1 \; -9 \; 9 \; 0$

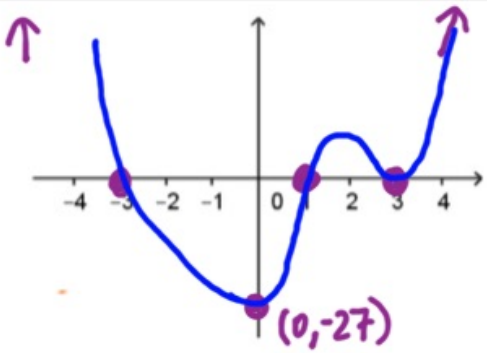
$\quad\quad 3 \; 6 \; -9$ ★

$1 \; 2 \; -3 \; 0$

$x^2 + 2x - 3$

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

-3×1, 3×-1, 2

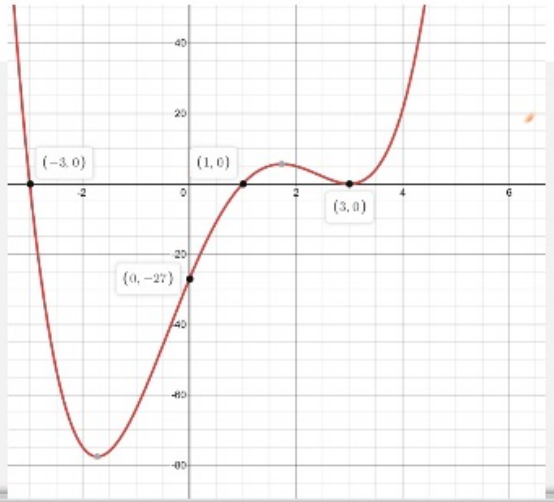


Factored Form:

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

Zeros:

$x=3$; mult 2 $x=-3$ $x=1$



Use long division to rewrite f(x) in factored form and find all zeros. Then sketch the graph. Show all work.

11] $f(x) = x^4 - 4x^3 - 6x^2 + 36x - 27$ has a factor of $(x-3)$ with multiplicity two.

$(x-3)^2$

$x^2 - 6x + 9 \overline{)x^4 - 4x^3 - 6x^2 + 36x - 27}$

$x^2 + 2x - 3$

$-(x^4 - 6x^3 + 9x^2)$

$2x^3 - 15x^2 + 36x$

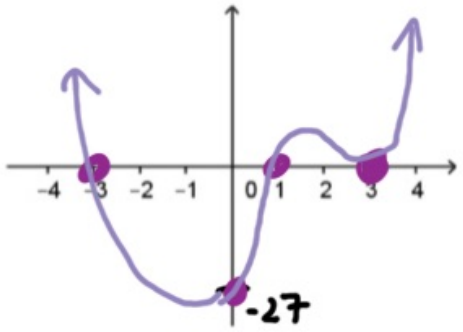
$-(2x^3 - 12x^2 + 18x)$

$-3x^2 + 18x - 27$

$-(-3x^2 + 18x - 27)$

0

alternate solution



Factored Form:

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

Zeros:

$x = 3$; mult 2 $x = -3$ $x = 1$

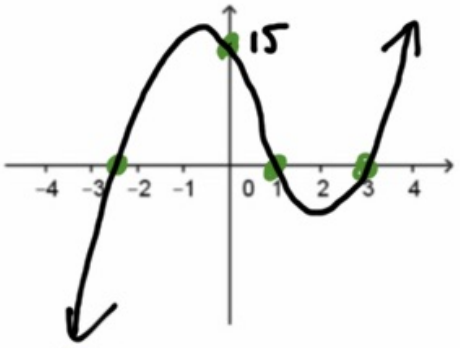
So .... $(x^2 - 6x + 9)(x^2 + 2x - 3) \rightarrow (x-3)(x-3)(x+3)(x-1)$

12] $f(x) = 2x^3 - 3x^2 - 14x + 15$ has factors of $(x-1)$ and $(x-3)$.

$$\begin{array}{r|rrr} 1 & 2 & -3 & -14 & 15 \\ & & 2 & -1 & -15 \\ \hline & 2 & -1 & -15 & 0 \end{array}$$

$$\begin{array}{r|rrr} 3 & 2 & -1 & -15 \\ & & 6 & 15 \\ \hline & 2 & 5 & 0 \end{array}$$

$2x+5$

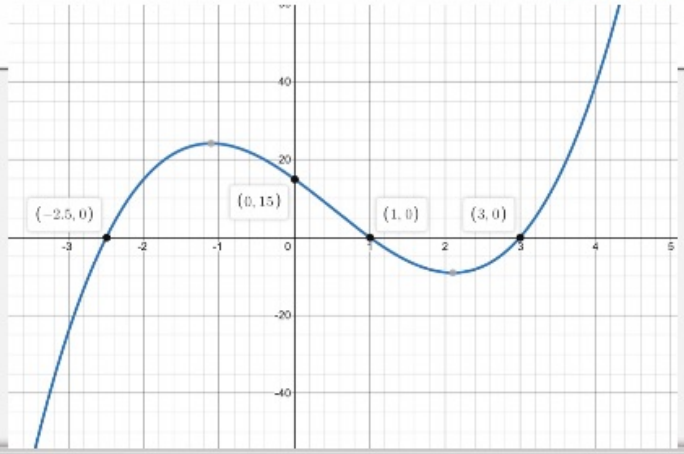


Factored Form:

$(x-1)(x-3)(2x+5)$

Zeros:

$x=1 \quad x=3 \quad x=-5/2$



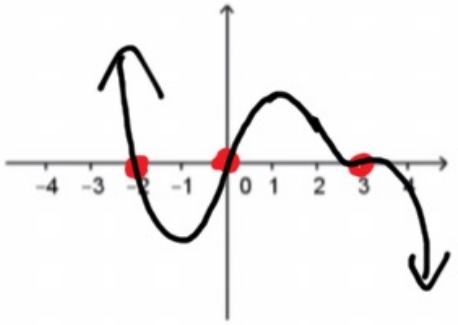
BONUS: $f(x) = -x^5 + 7x^4 - 9x^3 - 27x^2 + 54x$ has a factor of $(x-3)$ with multiplicity 3.

3	-1	7	-9	-27	54	0
		-3	12	9	-54	0
	-1	4	3	-18	0	0

3	-1	4	3	-18
		-3	3	18
	-1	1	6	0

3	-1	1	6
		-3	-6
	-1	-2	0

$\hookrightarrow -x^2 - 2x \rightarrow -x(x+2)$



Factored Form:

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

Zeros:

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

$x=0 \quad x=3; \text{mult } 3 \quad x=-2$