

Notes 3.10 – Polynomial Meanings

Investigation - Use the given information to fill in all the missing information for each polynomial.

1. Function in factored form:

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

Function in standard form:

$$y = -2x^3 + 6x - 4$$

End behavior:

As  $x \rightarrow -\infty$ : up

As  $x \rightarrow \infty$ : down

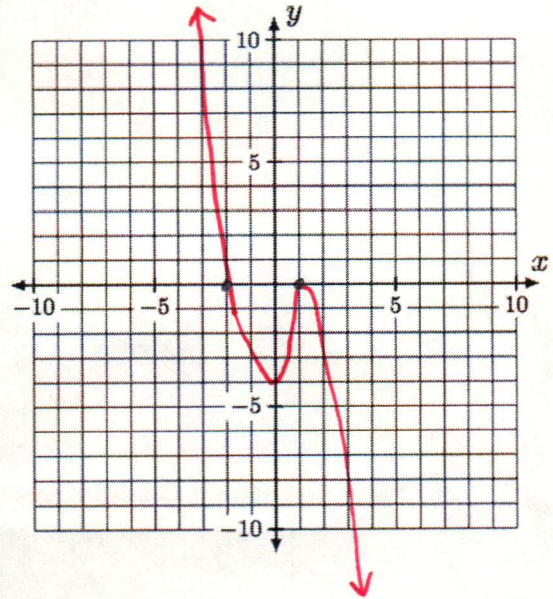
Roots:  $x = -2, 1, 1$

Value of leading coefficient:

-2 ↘

Degree: 3

Graph:



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

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

2. Function in factored form:

$$y = x(x-4)(x-2+i)(x-2-i)$$

Function in standard form:

$$y = x^4 - 8x^3 + 21x^2 - 20x$$

End behavior:

As  $x \rightarrow -\infty$ : up

As  $x \rightarrow \infty$ : up

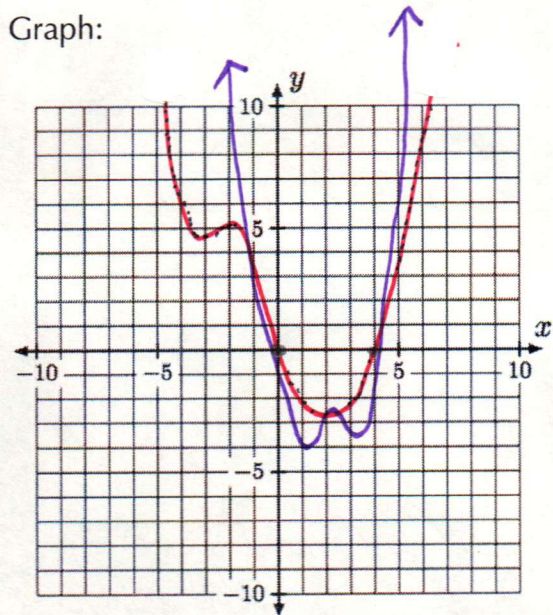
Roots:  $x = 2 \pm i, 4, 0$

Value of leading coefficient:

1 ↗

Degree: 4

Graph:



$$(x^2-4x)(x-2+i)(x-2-i)$$

$$(x^2-4x)(x^2-4x+5)$$

3. Function in factored form:

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

Function in standard form:

$$y = 2x^3 + 10x^2 + 6x - 18$$

End behavior:

As  $x \rightarrow -\infty$ : down

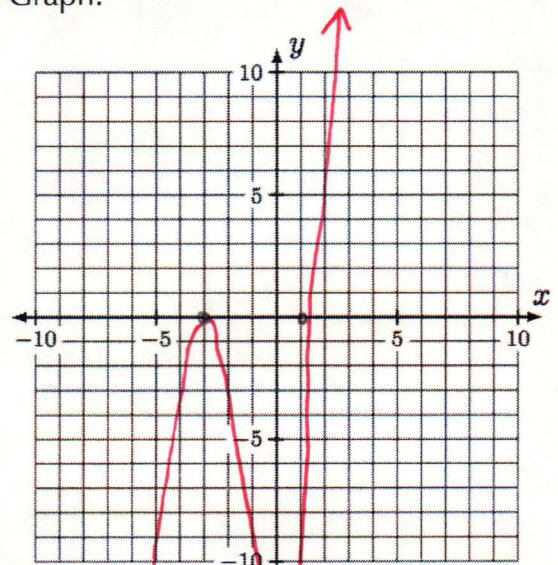
As  $x \rightarrow \infty$ : up

Roots:  $x = 1, -3, -3$

Value of leading coefficient: 2

Degree: 3 ↗

Graph:



$$2(x-1)(x^2 + 6x + 9)$$
$$2(x^3 + 5x^2 + 3x - 9)$$

4. Function in factored form:

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

Function in standard form:

$$y = -x^5 + x^4 + 5x^3 + 3x^2$$

End behavior:

As  $x \rightarrow -\infty$ : up

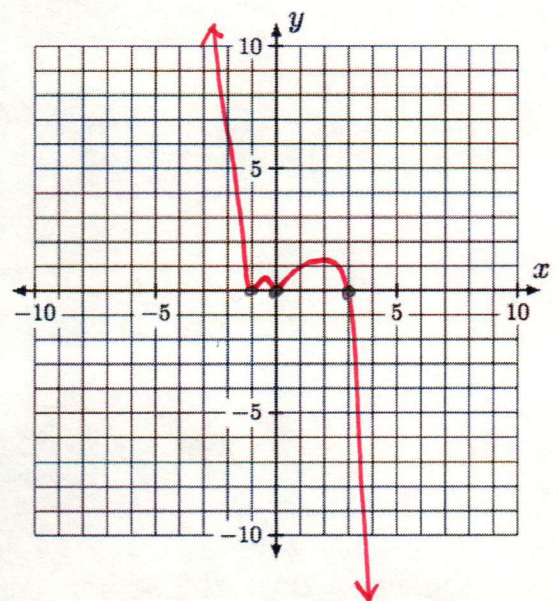
As  $x \rightarrow \infty$ :

Roots:  $x = 3, -1, -1, 0, 0$

Value of leading coefficient: -1

Degree: 5 ↘

Graph:



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

5. Function in factored form:

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

Function in standard form:

$$y = x^4 - 8x^2 + 16$$

End behavior:

As  $x \rightarrow -\infty$ : up

As  $x \rightarrow \infty$ : up

Roots:  $x = -2, -2, 2, 2$

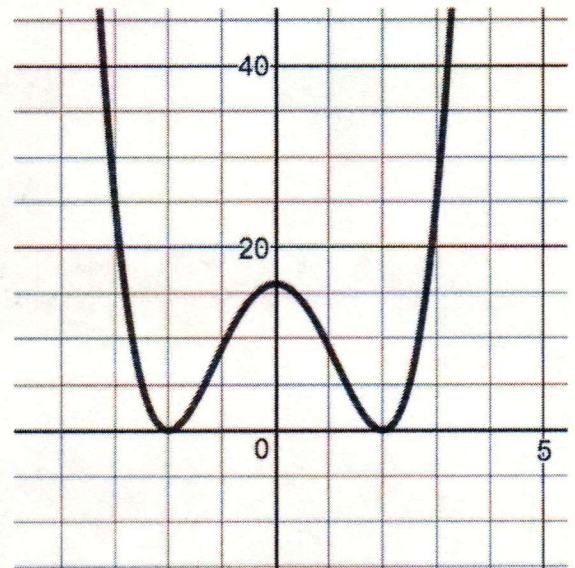
Value of leading coefficient:

1

Degree: 4

y-intercept: (0, 16)

Graph:



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

6. Function in factored form:

$$y = (x+2)(x-2+\sqrt{3})(x-2-\sqrt{3})$$

Function in standard form:

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

End behavior:

As  $x \rightarrow -\infty$ : down

As  $x \rightarrow \infty$ : up

Roots:

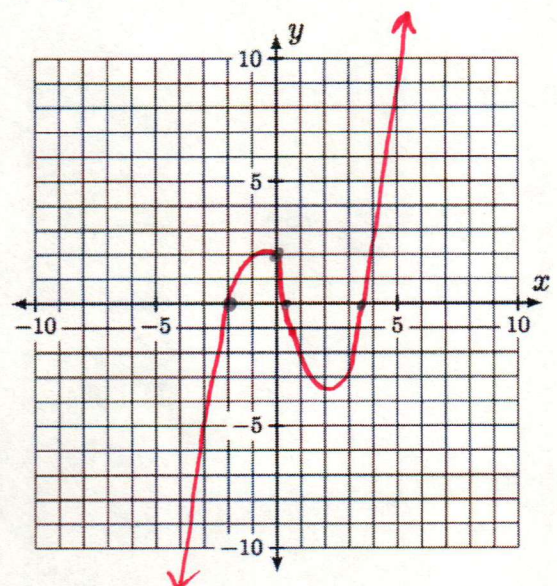
$$x = -2, 2 \pm \sqrt{3}$$

Degree: 3

Domain:  $\mathbb{R}$

Range:  $\mathbb{R}$

Graph:



$$\begin{array}{r|rrrr} -2 & 1 & -2 & -7 & 2 \\ & & -2 & 8 & -2 \\ \hline & 1 & -4 & 1 & 0 \end{array}$$

$$x^2 - 4x + 1$$

7. Function in factored form:

$$y = x(x - \sqrt{2})(x + \sqrt{2})$$

Function in standard form:

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

End behavior:

As  $x \rightarrow -\infty$ : down

As  $x \rightarrow \infty$ : up

Roots:  $x = 0, \pm\sqrt{2}$

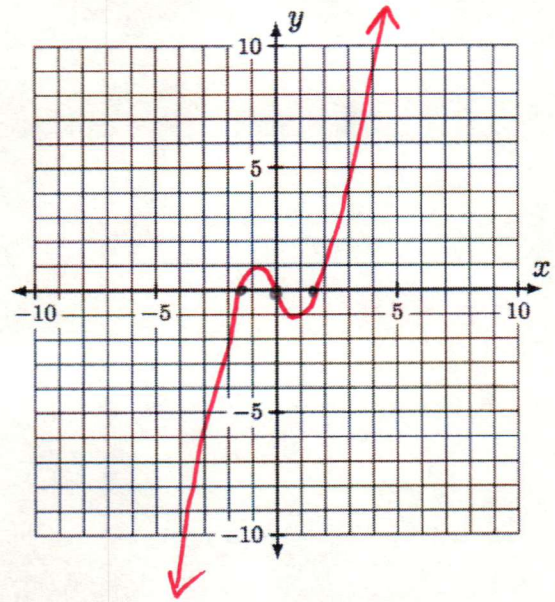
Value of leading coefficient: 1

Degree: 3

Domain:  $\mathbb{R}$

Range:  $\mathbb{R}$

Graph:



$$x^3 - 2x$$

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

$$x(x - \sqrt{2})(x + \sqrt{2})$$

$$x^2 = 2$$

$$x = \pm\sqrt{2}$$