

Polynomial Functions WS 1

1. $P(x) = (x-1)(x-2)(x+3)$

2. $x^3 + x^2 - 4x - 4 = 0$
 $x^2(x+1) - 4(x+1) = 0$
 $(x+1)(x^2 - 4) = 0$
 $x = -1 \quad x = \pm 2$

4.
$$\begin{array}{r|rrrr} 3 & 2 & -7 & 4 & \square \\ & & 6 & -3 & 3 \\ \hline & 2 & -1 & 1 & 0 \end{array}$$
 ← must be -3

5. $P = \pm(1, 2, 4, 8)$ $\frac{P}{q} = \pm(1, 2, 4, 8, \frac{1}{3}, \frac{2}{3}, \frac{4}{3}, \frac{8}{3})$
 $q = \pm(1, 3)$

6.
$$\begin{array}{r|rrrr} 3 & 1 & -4 & 1 & 6 \\ & & 3 & -3 & -6 \\ \hline & 1 & -1 & -2 & 0 \end{array}$$

$$\int x^2 - x - 2 = 0$$

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

7. $x = 3i \quad x = -3i \quad x = 1-2i \quad x = 1+2i$
 $f(x) = (x-3i)(x+3i)(x-1+2i)(x-1-2i)$
 $= (x^2 + 9)(x^2 - 2x + 5) = 0$
 $f'(x) = x^4 - 2x^3 + 14x^2 - 18x + 45$

10.
$$\begin{array}{r|rrrrr} 2 & 1 & -4 & 1 & 16 & -20 \\ & & 2 & -4 & -6 & 20 \\ \hline -2 & 1 & -2 & -3 & 10 & 0 \\ & & -2 & 8 & -10 & \\ \hline & 1 & -4 & 5 & 0 & \end{array}$$

$$x^2 - 4x + 5 = 0$$

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

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

$$x = \pm 2, 2 \pm i$$

11.
$$\begin{array}{r|rrrr} 5 & 1 & -3 & 3 & -6 \\ & & 5 & 10 & 65 \\ \hline & 1 & 2 & 13 & 59 \end{array}$$
 ← $f(5) = 59$

$$12. \quad \begin{array}{r} 1) \quad 2 \quad -1 \quad -7 \quad 6 \\ \quad \quad 2 \quad 1 \quad -6 \\ \hline 2 \quad 1 \quad -6 \quad | \quad 0 \end{array}$$

$$2x^2 + x - 6 = 0$$

$$(2x - 3)(x + 2) = 0$$

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

$$13. \quad a) \quad x^3 + 27 = 0$$

$$(x + 3)(x^2 - 3x + 9) = 0$$

$$x = -3 \quad x = \frac{+3 \pm \sqrt{-27}}{2} = \frac{3 \pm 3i\sqrt{3}}{2}$$

$$b) \quad x^4 - 9 = 0$$

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

$$x^2 = -3 \quad x^2 = 3$$

$$x = \pm i\sqrt{3} \quad x = \pm \sqrt{3}$$

$$c) \quad x^4 - 9x^2 + 20 = 0$$

$$(x^2 - 4)(x^2 - 5) = 0$$

$$x^2 = 4 \quad x^2 = 5$$

$$x = \pm 2 \quad x = \pm \sqrt{5}$$