

Questions From Homework

$$\textcircled{1} \text{ b) } x^2 - 9x + 14 \quad \begin{array}{l} -2 \times -7 = 14 \\ -2 + -7 = -9 \end{array}$$

$$(x-7)(x-2)$$

$$\textcircled{1} \text{ f) } 6y^2 - 11y + 3 \quad \begin{array}{l} -2 \times -9 = 18 \\ -2 + 9 = -11 \end{array}$$

$$(y-\frac{2}{6})(y-\frac{9}{6})$$

$$(y-\frac{1}{3})(y-\frac{3}{2})$$

$$(3y-1)(2y-3)$$

1, 8, 27, 64, 125... perfect cubes

$$\textcircled{2} \text{ c) } t^3 + 64 \quad a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$(t+4)(t^2 - 4t + 16)$$

$$\text{b) } x^3 - 1 \quad a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

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

$$\textcircled{3} \text{ a) } (x^3 - x^2) - 16x + 16$$

$$x^2(x-1) - 16(x-1)$$

$$(x-1)(x^2 - 16) \quad \leftarrow \text{Diff of square } a^2 - b^2 = (a-b)(a+b)$$

$$(x-1)(x+4)(x-4)$$

$$\textcircled{3} \text{ b) } x^3 + 2x^2 - 11x - 12 \quad x = -1$$

$$(-1)^3 + 2(-1)^2 - 11(-1) - 12 \quad (x+1) \text{ is a factor}$$

$$-1 + 2 + 11 - 12$$

$$0$$

$$\begin{array}{r} x^3 + 2x^2 - 11x - 12 \\ \underline{-(x^3 + x^2)} \\ x^2 - 11x - 12 \\ \underline{-(x^2 + x)} \\ -12x - 12 \\ \underline{-(-12x - 12)} \\ 0 \end{array} \quad \begin{array}{l} \frac{4}{4} x^{-3} = -b \\ \frac{4}{4} + -3 = 1 \end{array}$$

$$(x+1)(x^2 + x - 12)$$

$$(x+1)(x+4)(x-3)$$

## Questions From Homework

$$\textcircled{1} \text{ e) } \underline{5}x^2 + \underline{13}x + \underline{6} \quad \begin{array}{l} \underline{10} \times \underline{3} = \underline{30} \\ \underline{10} + \underline{3} = \underline{13} \end{array}$$

$$(x + \frac{10}{5})(x + \frac{3}{5})$$

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

$$\textcircled{1} \text{ g) } t^3 + 2t^2 - 3t$$

$$t(t^2 + 2t - 3) \quad \begin{array}{l} -1 \times 3 = -3 \\ -1 + 3 = 2 \end{array}$$

$$t(t-1)(t+3)$$

$$\textcircled{2} \text{ f) } x^6 + 8 \quad a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

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

$$\textcircled{2} \text{ g) } x^4 - 16$$

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

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

$$\textcircled{3} \text{ b) } x^3 + 0x^2 - 7x + 6 \quad x=1$$

$$(1)^3 + 0(1)^2 - 7(1) + 6 \quad (x-1) \text{ is a factor}$$

$$1 + 0 - 7 + 6$$

$$0$$

$$\begin{array}{r|l} x-1 & \begin{array}{r} x^2 + x - 6 \\ \underline{x^3 + 0x^2 - 7x + 6} \\ -(x^3 - x^2) \\ \hline x^2 - 7x + 6 \\ -(x^2 - x) \\ \hline -6x + 6 \\ -(-6x + 6) \\ \hline 0 \end{array} & \begin{array}{l} (x-1)(x^2 + x - 6) \\ (x-1)(x+3)(x-2) \end{array} \end{array}$$

## Synthetic Substitution

Factor using synthetic substitution  $x^3 - 7x^2 - 4x + 28$

Find a value of x that makes it equal 0

$$\begin{aligned}
 & (\cancel{2})^3 - 7(\cancel{2})^2 - 4(\cancel{2}) + \cancel{28} \\
 & 8 - 28 - 8 + 28 = 0
 \end{aligned}$$

(x-value)

$$\begin{array}{r}
 \cancel{2} \\
 \hline
 \end{array}$$



$$(x - \cancel{2})(x^2 - 5x - 14)$$

$$(x - \cancel{2})(x - 7)(x + 2)$$

(Coefficients of the polynomial)

$$\begin{array}{cccc}
 1 & -7 & -4 & 28 \\
 & \cancel{2} & -10 & -\cancel{28} \\
 \hline
 1 & -5 & -14 & 
 \end{array}$$



$$\begin{aligned}
 \underline{-7} \times \underline{\cancel{2}} &= -14 \\
 \underline{-7} + \underline{\cancel{2}} &= -5
 \end{aligned}$$

Bring down the first coefficient

Multiply the first coefficient by the *x-value* and place under the second coefficient. ADD.

Repeat the steps. The coefficients of the other factor are in the bottom row.

$$\begin{aligned} & (x^3 - 7x^2)(4x + 28) \\ & x^2(x-7) - 4(x-7) \\ & (x-7)(x^2 - 4) \\ & (x-7)(x+2)(x-2) \end{aligned}$$

$$x^3 + 5x^2 - 2x - 24 \quad \text{Find a value of } x \text{ that makes it equal } 0$$

$$\begin{aligned} (-3)^3 + 5(-3)^2 - 2(-3) - 24 \\ -27 + 45 + 6 - 24 = 0 \end{aligned}$$

(x-value)

$$\underline{-3} \Big|$$



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

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

(Coefficients of the polynomial)

$$\begin{array}{cccc} 1 & 5 & -2 & -24 \end{array}$$

$$\begin{array}{cccc} & -3 & -6 & 24 \end{array}$$

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$$\begin{array}{cccc} 1 & 2 & -8 & \end{array}$$



$$\underline{-2} \times \underline{4} = -8$$

$$\underline{-2} + \underline{4} = 2$$

# Homework

② a)  $x^3 - 4x^2 + x + 6 = 0$        $x = -1$  is a root

$$(-1)^3 - 4(-1)^2 + (-1) + 6 = 0$$

$$-1 - 4 - 1 + 6 = 0$$

$$0 = 0$$

③ a)  $(x^3 - x^2 - 14x + 24) \div (x - 2)$

$$\begin{array}{r|rrrr} 2 & 1 & -1 & -14 & 24 \\ & & 2 & 2 & -24 \\ \hline & 1 & 1 & -12 & \end{array}$$

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

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