

①

$$\begin{array}{r}
 x^3 - x^2 + 1 \\
 3x-2 \overline{) 3x^4 - 5x^3 + 2x^2 + 3x - 2} \\
 \underline{3x^4 - 2x^3} \quad \downarrow \quad \downarrow \quad \downarrow \\
 -3x^3 + 2x^2 + 3x - 2 \\
 \underline{-3x^3 + 2x^2} \quad \downarrow \quad \downarrow \\
 3x - 2 \\
 \underline{3x - 2} \\
 0
 \end{array}$$

Ans: $x^3 - x^2 + 1$

②

$$\begin{array}{r}
 x^2 + 4x + 5 \\
 2x+1 \overline{) 2x^3 + 9x^2 + 14x + 5} \\
 \underline{2x^3 + x^2} \quad \downarrow \quad \downarrow \\
 8x^2 + 14x + 5 \\
 \underline{8x^2 + 4x} \\
 10x + 5 \\
 \underline{10x + 5} \\
 0
 \end{array}$$

Yes it is a factor

$$2x^3 + 9x^2 + 14x + 5 = (2x+1)(x^2 + 4x + 5)$$

Solve: $2x+1=0$ $x^2 + 4x + 5 = 0$

$-1 \quad -1$ $a=1 \quad b=4 \quad c=5$

$\frac{2x}{2} = \frac{-1}{2}$ $x = \frac{-4 \pm \sqrt{16-4(1)(5)}}{2(1)}$

$x = \frac{-4 \pm \sqrt{-4}}{2} = \frac{-4 \pm 2i}{2}$

$x = \frac{-2 \pm i}{1} = \boxed{-2 \pm i}$

$$\begin{array}{r}
 2 \overline{) 1 \quad -4 \quad 6 \quad -4} \\
 \downarrow \\
 1 \quad -2 \quad 2 \quad \boxed{0}
 \end{array}$$

Ans: $x^2 - 2x + 2$

$$\begin{array}{r}
 1 \overline{) 1 \quad 3 \quad -1 \quad -3} \\
 \downarrow \\
 1 \quad 4 \quad 3 \quad \boxed{0}
 \end{array}$$

Given

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

$$(x-1)(x+3)(x+1) = 0$$

$x-1=0$ $x+3=0$ $x+1=0$

$+1 \quad +1$ $-3 \quad -3$ $-1 \quad -1$

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

$$\begin{array}{r}
 -2 \overline{) 1 \quad 4 \quad -8 \quad -6} \\
 \downarrow \\
 1 \quad -2 \quad -4 \quad 24
 \end{array}$$

Ans: $f(-2) = 18$

$$\begin{array}{r}
 \checkmark \quad \underline{-2} \quad 1 \quad 4 \quad -8 \quad -10 \\
 \quad \quad \downarrow \quad -2 \quad -4 \quad 24 \\
 \hline
 1 \quad 2 \quad -12 \quad \boxed{18}
 \end{array}$$

$$\boxed{\text{Ans: } f(-2) = 18}$$

⑥ $x^3 + 13x = 10x^2$

$$\begin{array}{r}
 x^3 + 13x - 10x^2 = 0 \\
 x^3 - 10x^2 + 13x = 0 \\
 x(x^2 - 10x + 13) = 0
 \end{array}$$

$a=1 \quad b=-10 \quad c=13$

$$x = \frac{-(-10) \pm \sqrt{100 - 4(1)(13)}}{2(1)}$$

$$x = \frac{10 \pm \sqrt{48}}{2} = \frac{10 \pm \sqrt{16 \cdot 3}}{2}$$

$$x = \frac{10 \pm 4\sqrt{3}}{2} = \frac{2(5 \pm 2\sqrt{3})}{2}$$

$x=0 \quad x=5 \pm 2\sqrt{3}$

⑦ $64x^3 = -8$

$$\begin{array}{r}
 64x^3 + 8 = 0 \\
 8(8x^3 + 1) = 0 \\
 8x^3 + 1 = 0
 \end{array}$$

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

$a=4 \quad b=-2 \quad c=1$

$$x = \frac{-(-2) \pm \sqrt{4 - 4(4)(1)}}{2(4)}$$

$$x = \frac{2 \pm \sqrt{-12}}{8} = \frac{2 \pm i\sqrt{4 \cdot 3}}{8}$$

$$x = \frac{2 \pm 2i\sqrt{3}}{8} = \frac{2(1 \pm i\sqrt{3})}{4 \cdot 2}$$

$x = \frac{1 \pm i\sqrt{3}}{4}$

$2x+1=0$

$$\begin{array}{r}
 2x = -1 \\
 x = -\frac{1}{2}
 \end{array}$$

⑧ $x^4 - 64 = 0$

$$(x^2 - 8)(x^2 + 8) = 0$$

$$\begin{array}{r}
 x^2 - 8 = 0 \quad x^2 + 8 = 0 \\
 \sqrt{x^2} = \pm\sqrt{8} \quad \sqrt{x^2} = \pm\sqrt{-8} \\
 x = \pm\sqrt{4 \cdot 2} \quad x = \pm i\sqrt{4 \cdot 2}
 \end{array}$$

$x = \pm\sqrt{4 \cdot 2} \quad x = \pm i\sqrt{4 \cdot 2}$

$$\sqrt{x} = 10$$

$$x = \pm \sqrt{4 \cdot 2} \quad x = \pm i\sqrt{4 \cdot 2}$$

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

$$\textcircled{9} \quad x^4 + 7x^2 = 18$$

$$x^4 + 7x^2 - 18 = 0$$

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

$$x^2 + 9 = 0 \quad x^2 - 2 = 0$$

$$\sqrt{x^2 = -9} \quad \sqrt{x^2 = 2}$$

$$x = \pm 3i \quad x = \pm \sqrt{2}$$

$$\textcircled{10} \quad 3x^3 - 6x^2 - 9x = 0$$

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

$$3x(x - 3)(x + 1) = 0$$

$$\frac{x}{3} = 0 \quad x - 3 = 0 \quad x + 1 = 0$$

$$x = 0 \quad x = 3 \quad x = -1$$

$$\textcircled{11} \quad 0.0000924x^3 - .54x^2 + 1038x - 669107 = y \quad (\text{cubic})$$

Notice on calc

$$a = 9.24 \text{ E-5} \Rightarrow 7.24 \times 10^{-5} = .0000924$$

$$e1980 \quad y = 2.032$$

$$\textcircled{12} \quad (2+2x)^4$$

$$= 1(2)^4 + 4(2)^3(2x)^1 + 6(2)^2(2x)^2 + 4(2)(2x)^3 + 1(2x)^4$$

$$= 16 + 64x + 96x^2 + 64x^3 + 16x^4$$

$$\begin{array}{ccccccc} & & & & 1 & & \\ & & & & 1 & & \\ & & & 1 & & 2 & \\ & & 1 & & 3 & & 3 & \\ & 1 & & 4 & & 6 & & 4 & \\ & & & & & & & & 1 \end{array}$$