



Factor Theorem 1 - SOLUTIONS



1. $(x + 2)(x - 3)$
2. $(x + 3)(x + 4)$
3. $x = 1, -3, 5$
4. $x = 2, -3, 4$
5. $x = -2, 4, -4$ (S*)
6. $x = -2, -3, 5$
7. $x = -\frac{2}{3}, 1, -1$ (S*)
8. $k = -2$ $(x - 1)(x + 2)$
9. $p = -11$ $(x + 4)(x - 3)$
10. $k = 2$ $(x + 1)(2x - 1)$ (S*)
11. $a = -2, b = -5$ $x = -2, 3, 1$
12. $p = -3, q = -10$ $x = -3, 4, 2$
13. $a = 2, b = 2$ $x = \frac{1}{2}, -3, -1$ (S*)



**Question 5**Try $x = 1$

$$(1)^3 + 2(1)^2 - 16(1) - 32 \\ \rightarrow -45 \neq 0$$

Try $x = -1$

$$(-1)^3 + 2(-1)^2 - 16(-1) - 32 \\ \rightarrow -15 \neq 0$$

Try $x = 2$

$$(2)^3 + 2(2)^2 - 16(2) - 32 \\ \rightarrow -48 \neq 0$$

Try $x = -2$

$$(-2)^3 + 2(-2)^2 - 16(-2) - 32 \\ \rightarrow 0 = 0$$

 $x = -2$ is a root**So $(x + 2)$ is the factor**

$$\begin{array}{r} x^2 \quad \quad \quad -16 \\ x+2) \overline{x^3 + 2x^2 - 16x - 32} \\ \underline{-x^3 - 2x^2} \\ \quad \quad \quad -16x - 32 \\ \underline{\quad \quad \quad 16x + 32} \\ \quad \quad \quad 0 \end{array}$$

$$\begin{aligned} x^2 - 16 &= 0 \\ (x - 4)(x + 4) &= 0 \\ x = 4 \quad x = -4 \quad \text{and} \quad x = -2 \end{aligned}$$



**Question 7**Try $x = 1$

$$\begin{aligned} 3(1)^3 + 2(1)^2 - 3(1) - 2 \\ \rightarrow 0 = 0 \end{aligned}$$

 $x = 1$ is a rootSo $(x - 1)$ is the factor

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

$$\begin{aligned} 3x^2 + 5x + 2 &= 0 \\ (3x + 2)(x + 1) &= 0 \\ x = -\frac{2}{3}, x = -1 \quad \text{and} \quad x = 1 \end{aligned}$$

Question 10 $(x + 3)$ is a factor so $x = -3$ is a root.

$$\begin{aligned} 2(-3)^3 + 7(-3)^2 + k(-3) - 3 &= 0 \\ -54 + 63 - 3k - 3 &= 0 \\ -3k + 6 &= 0 \\ -3k &= -6 \\ k &= 2 \end{aligned}$$

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

$$\begin{aligned} 2x^2 + x - 1 \\ (2x - 1)(x + 1) \end{aligned}$$



**Question 13**

$(2x - 1)$ is a factor so $x = \frac{1}{2}$ is a root.

$$\begin{aligned} a\left(\frac{1}{2}\right)^3 + 7\left(\frac{1}{2}\right)^2 + b\left(\frac{1}{2}\right) - 3 &= 0 \\ \frac{1a}{8} + \frac{7}{4} + \frac{b}{2} - 3 &= 0 \quad (\times 8) \\ a + 14 + 4b - 24 &= 0 \\ a + 4b &= 10 \end{aligned}$$

$(x + 3)$ is a factor so $x = -3$ is a root.

$$\begin{aligned} a(-3)^3 + 7(-3)^2 + b(-3) - 3 &= 0 \\ -27a + 63 - 3b - 3 &= 0 \\ 27a + 3b &= 60 \end{aligned}$$

Simultaneous equations:

$$\begin{array}{rcl} a + 4b &= 10 & (\times 3) \\ 27a + 3b &= 60 & (\times -4) \\ \hline \end{array}$$

$$\begin{array}{rcl} 3a + 12b &= 30 \\ -108a - 12b &= -240 \\ \hline \end{array}$$

$$-105a = -210$$

$$a = 2$$

$$(2) + 4b = 10$$

$$4b = 10 - 2$$

$$4b = 8$$

$$b = 2$$

$$\begin{array}{r} x^2 + 4x + 3 \\ 2x - 1 \) \overline{) 2x^3 + 7x^2 + 2x - 3} \\ - 2x^3 + x^2 \\ \hline 8x^2 + 2x \\ - 8x^2 + 4x \\ \hline 6x - 3 \\ - 6x + 3 \\ \hline 0 \end{array}$$

$$x^2 + 4x + 3 = 0$$

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

$$x = -3 \quad x = -1 \quad \text{and} \quad x = \frac{1}{2}$$

