

$$\begin{array}{r|rrrrr} -3 & 2 & 9 & 0 & -7 & 10 \\ & & -6 & -9 & 27 & -60 \\ \hline & 2 & 3 & -9 & 20 & -50 \end{array}$$

No. -3 is not a zero because $(x+3)$ doesn't divide the polynomial.

$$\begin{array}{r|rrrrr} -7 & 1 & 9 & 15 & 5 & -14 \\ & & -7 & -14 & -7 & 14 \\ \hline & 1 & 2 & 1 & -2 & 0 \end{array}$$

$(x+7)$ is a factor because there is no remainder.

$$\begin{aligned} & 3(3)^4 - 11(3)^3 - (3)^2 + 15(3) - 12 \\ & 243 - 297 - 9 + 45 - 12 = -30 \end{aligned}$$

$$\begin{array}{r|rrrr} -5 & 3 & 14 & -7 & -10 \\ & & -15 & 5 & 10 \\ \hline & 3 & -1 & -2 & 0 \end{array} \Rightarrow (x+5)(3x^2-x-2) \Rightarrow (x+5)(3x+2)(x-1)$$

$$(5) (x-1)^3(x)(x+4)$$

6.

#2

$$\begin{array}{r|rrrr} -1 & 1 & -3 & -11 & -7 \\ & & -1 & 4 & 7 \\ \hline & 1 & -4 & -7 & 0 \end{array} \Rightarrow (x+1)(x^2-4x-7)$$

$$\frac{4 \pm \sqrt{16 - 4(-7)}}{2} = \frac{4 \pm \sqrt{16 + 28}}{2}$$

$$x = -1, 2 - \sqrt{11}, 2 + \sqrt{11} = \frac{4 \pm \sqrt{44}}{2} = 2 \pm \sqrt{11}$$

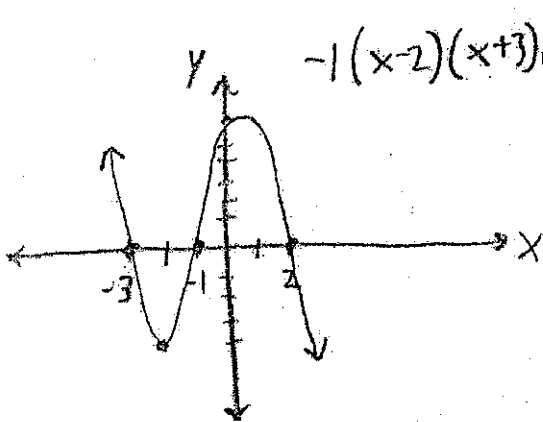
7.

$$\begin{array}{r|rrrrr} 4 & 6 & -23 & -6 & +8 \\ & & 24 & 4 & -8 \\ \hline & 6 & 1 & -2 & 0 \end{array} \Rightarrow (x-4)(6x^2+x-2) \Rightarrow (x-4)(3x+2)(2x-1)$$

8.

$$\left. \begin{array}{l} x-4=0 \quad x=4 \\ 3x+2=0 \quad x=-\frac{2}{3} \\ 2x-1=0 \quad x=\frac{1}{2} \end{array} \right\} 3 \text{ roots}$$

9.



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

1. Draw zero points
2. Find value of points in between

$$p(-2) = -1(-2-2)(-2+3)(-2+1) = -1(-4)(1)(-1) = -4$$

$$p(0) = -1(-2)(3)(1) = 6$$

10.
$$\begin{array}{r|rrrr} 6 & 1 & -11 & 36 & -36 \\ & & 6 & -30 & 36 \\ \hline & 1 & -5 & 6 & 0 \end{array}$$

$(x-6)(x^2-5x+6) = 0$
 $(x-6)(x-2)(x-3) = 0$
 $x = 6, 2, 3$

11.
$$\begin{array}{r|rrrr} 8 & 15 & -119 & -10 & 16 \\ & & 120 & 8 & -16 \\ \hline & 15 & 1 & -2 & 0 \end{array}$$

$(x-8)(15x^2+1x-2) = 0$
 $(x-8)(3x-1)(5x+2) = 0$
 $x = 8 \quad x = \frac{1}{3} \quad x = -\frac{2}{5}$

12.
$$\begin{array}{r} x^3 + 0x^2 + 18x + 42 \\ x-3 \overline{) x^4 - 3x^3 + 18x^2 - 12x + 16} \\ \underline{x^4 - 3x^3} \\ 0 + 18x^2 - 12x \\ \underline{18x^2 - 54x} \\ 42x + 16 \\ \underline{42x - 126} \\ 142 \end{array}$$

$r = \frac{142}{x-3}$

13.
$$\begin{array}{r|rrrr} 4 & 2 & -10 & +9 & -4 \\ & & 8 & -8 & 4 \\ \hline & 2 & -2 & 1 & 0 \end{array}$$

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

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

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

$= \frac{2 \pm 2i}{4} = \frac{1 \pm i}{2}$

e:
1
S
1
F
O

14. The conjugate. $3-2i$

15. (a) as $x \rightarrow \infty$, $f(x) \rightarrow \infty$
as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$

(b) as $x \rightarrow \infty$, $f(x) \rightarrow -\infty$
as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$ } both $-\infty!$

16. $x = .3$ $\lambda = 1.5$ $x = 4.2$

17. $x = 0$ $x = -3$ $x = 1$ multiplicity 2

18. $(x-1)(x-2)^3 \Rightarrow (x-1)(x-2)(x-2)(x-2)$
 $(x^2-3x+2)(x^2-4x+4)$

$$\underline{x^4} - \underline{4x^3} + \underline{4x^2} - \underline{3x^3} + \underline{12x^2} - \underline{12x} + \underline{2x^2} - \underline{8x} + \underline{8}$$

$$x^4 - 7x^3 + 18x^2 - 20x + 8$$

19. $-2 \mid \begin{array}{cccccc} 4 & 10 & -11 & -22 & 20 & 10 \\ & -8 & -4 & 30 & -16 & -8 \\ \hline 4 & 2 & -15 & 8 & 4 & 2 \end{array}$ $f(-2) = 2$

$$20. \begin{array}{r|rrrr} 2 & 2 & 15 & -14 & -48 \\ & & 4 & 38 & 48 \\ \hline & 2 & 19 & 24 & 0 \end{array}$$

$$(x-2)(2x^2+19x+24)$$

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

21. (a) even 4 zeros

(b) odd 3 zeros

(c) odd 3 zeros

$$22. -2, -\frac{2}{3}, -1 \pm \sqrt{3}$$

$$23. \frac{1}{3}, \pm\sqrt{2}$$

$$\begin{aligned}
 (24) \quad x^2 + 4 &= 8x \\
 x^2 - 8x &= -4 \\
 x^2 - 8x + 16 &= -4 + 16 \\
 (x - 4)^2 &= 12 \\
 x - 4 &= \pm \sqrt{12} \\
 x &= 4 \pm 2\sqrt{3}
 \end{aligned}$$

$$\begin{aligned}
 (25) \quad x^2 - 5x &= 8 \\
 x^2 - 5x + \frac{25}{4} &= 8 + \frac{25}{4} \\
 (x - \frac{5}{2})^2 &= \frac{32}{4} + \frac{25}{4} \\
 (x - \frac{5}{2})^2 &= \frac{67}{4} \\
 x - \frac{5}{2} &= \pm \frac{\sqrt{67}}{2} \\
 x &= \frac{5}{2} \pm \frac{\sqrt{67}}{2}
 \end{aligned}$$

$$\begin{aligned}
 (26) \quad \frac{2x^2 - 12x}{2} &= \frac{8}{2} \\
 x^2 - 6x &= 4 \\
 x^2 - 6x + 9 &= 4 + 9 \\
 (x - 3)^2 &= 13 \\
 x - 3 &= \pm \sqrt{13} \\
 x &= 3 \pm \sqrt{13}
 \end{aligned}$$

$$\begin{aligned}
 (27) \quad \frac{4x^2 - 12x}{4} &= \frac{16}{4} \\
 x^2 - 3x &= 4 \\
 x^2 - 3x + \frac{9}{4} &= 4 + \frac{9}{4} \\
 (x - \frac{3}{2})^2 &= \frac{16}{4} + \frac{9}{4} \\
 (x - \frac{3}{2})^2 &= \frac{25}{4} \\
 x - \frac{3}{2} &= \pm \frac{5}{2} \\
 x &= \frac{3}{2} \pm \frac{5}{2} \\
 x &= \frac{3}{2} + \frac{5}{2} \text{ or } x = \frac{3}{2} - \frac{5}{2} \\
 x &= 4 \text{ or } -1
 \end{aligned}$$