

Factor Completely:

1. $x^3 - x^2 - 49x + 49$ $(x-7)(x+7)(x-1)$

2. $125x^3 - 27$ $(5x-3)(25x^2 + 15x + 9)$

3. $125x^3 - 100x$ $25x(5x^2 - 4)$

4. $128x^3 + 54$ $2(4x+3)(16x^2 - 12x + 9)$

Solve using the Quadratic Formula.

5. $3x^2 - 10x + 5 = 0$ $\frac{5 \pm \sqrt{10}}{3}$

6. $13x^2 - 17x - 15 = 0$ ~~$\frac{17 \pm \sqrt{1069}}{26}$~~

Solve using Completing the Square

7. $2x^2 - 16x - 22 = 0$ $x = 4 \pm 3\sqrt{3}$

8. $3x^2 - 18x + 51 = 0$ ~~$3 \pm 2\sqrt{2}$~~

Simplify:

17. $\frac{x^2 - 7x + 12}{x^3 - 27}$ $\frac{x-4}{x^2 + 3x + 9}$

18. $\frac{5}{\sqrt{7} - \sqrt{5}}$ $\frac{5\sqrt{7} + 5\sqrt{5}}{2}$

19. $\frac{\frac{x}{x+2} - \frac{x-2}{x-1}}{\frac{3}{x+2} + \frac{x}{x-1}}$ $\frac{-x+4}{x^2 + 5x - 3}$

20. $\left(\frac{-8}{27}\right)^{\frac{2}{3}}$ $\frac{4}{9}$

Solve:

21. Let $A = \begin{pmatrix} -1 & -3 \\ 4 & 2 \\ 5 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} -3 & 2 \\ -4 & -1 \end{pmatrix}$. Be certain that your answers are in proper format.

a) Solve: $4B$ $\begin{bmatrix} -12 & 8 \\ -16 & -4 \end{bmatrix}$

b) Solve: $3Ax4B$ $\begin{bmatrix} 180 & 12 \\ -240 & 72 \\ -228 & 108 \end{bmatrix}$

c) Solve: $(Ax+B)+A$ $\begin{bmatrix} 14 & -2 \\ -16 & 8 \\ -14 & 10 \end{bmatrix}$

22. Solve:

Let $A = \begin{pmatrix} 7 & -1 & 8 \\ -4 & 0 & 5 \\ 9 & -3 & -1 \end{pmatrix}$ Let $B = \begin{pmatrix} -1 & -3 & 2 \\ 4 & -1 & 8 \\ 2 & 7 & -1 \end{pmatrix}$

a) $A+B = \begin{bmatrix} 6 & -4 & 10 \\ 5 & -1 & 13 \\ 11 & 4 & -2 \end{bmatrix}$
 b) $AB = \begin{bmatrix} 5 & 36 & -2 \\ 14 & 47 & -13 \\ -23 & -31 & -5 \end{bmatrix}$

c) $(AB)B = \begin{bmatrix} 135 & -65 & 300 \\ 148 & -80 & 417 \\ -111 & 65 & -289 \end{bmatrix}$

23. Place the following into an Augmented Matrix. Solve by Elementary Row Operations. Your matrix MUST finish in Row-Echelon form. Solutions without proper Elementary Row Operations work shown will not be considered for credit.

$$\begin{cases} -3x + y - 6z = 12 \\ x - 4y + 2z = -26 \\ 4x + y + z = -23 \end{cases}$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 2 & -2 \\ 0 & 1 & 0 & 6 \\ 0 & 0 & 1 & 3 \end{array} \right]$$

$x = -8 \quad y = 6 \quad z = 3$

24. Aidan has a motorboat that can go 16 miles downstream on a river in 20 minutes. It takes 30 minutes for his boat to go back upstream the same 16 miles. Find the speed of Aidan's boat in still water and find the speed of the current.

$$16 = \frac{1}{3} (r+c)$$

$$16 = \frac{1}{2} (r-c)$$

$r = 40 \text{ MPH}$

25. Write the polynomial in standard form with roots of 0, and $1-i$ and where $f(2)=15$

26. Sketch the graph the function $f(x) = \frac{x^2 - 9}{x + 1}$

$$f(x) = \frac{15}{4}x^3 - \frac{15}{2}x^2 + \frac{15}{2}x$$

27. Sketch the graph the function $f(x) = \frac{x^2 + 7x + 12}{x^2 - 16}$

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28. Sketch the graph the function $f(x) = \frac{x^2 + 4x + 3}{x^3 + x^2 - 6x}$

29. Find $p(-17)$ if $p(x) = 5x^3 + 23x^2 + 11x - 10$ (Use the Remainder Theorem) $= 18115$

30. Graph the polynomial. Label ALL of the important information:

$$h(x) = -3x^3 + x^4 - 18x^2$$

31. Given the equation: $f(x) = x^2 - 2x - 7$, find the Difference Quotient for it: $\frac{f(x+h) - f(x)}{h}, h \neq 0$
 (Your answer must be in most simplified form) $2x + A - 2$

32. Find the center and radius of the given circle: $x^2 + 3x + 10y = 407 + 13x - y(y + 14)$
 CENTER: $(5, -12)$ RADIUS: 24

Solve by any legal method:

33. $\frac{2}{x^2} + \frac{4}{x} + 1 = 0$ ~~3~~ $x = -2 \pm \sqrt{2}$ 34. $\sqrt{x-4} + 5 = 7 - \sqrt{x+3}$ $x = \frac{73}{16}$

35. There is a line that passes through the points: $(-22, 17)$ and $(15, -16)$. Find an equation in Standard form for a line that is **parallel** to the given line and passes through the point $(-9, 12)$

$33x + 37y = 147$

Simplify each expression.

36. $(9+i)(3-5i)$ $32 - 42i$ 37. $(4 + \sqrt{-9}) + (6 - \sqrt{-196})$ $66 - 38i$

38. Tori and Jacquelyn live 391km apart along a straight highway. They began travelling toward each other at 10:15 a.m. Tori drove at 50 km/h and Jacquelyn drove $1.3x$ as fast as Tori. What time of day did they meet up?

1:39 P.M.

Simplify

39. $\sqrt[4]{\frac{a^7b}{27b^2}}$ $a \frac{\sqrt[4]{3a^3b^3}}{3b}$ 40. $\frac{2x^4 - 32}{4x - 8}$ $\frac{(x+2)(x^2+4)}{2}$

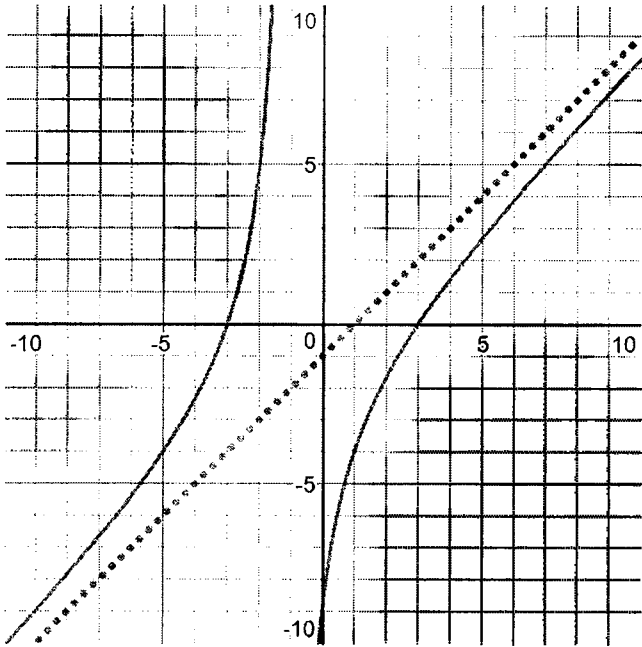
41. $\frac{\frac{4}{x+y} - \frac{4}{x}}{y}$ $\frac{-4}{x(x+y)}$ 42. $\frac{3 + \sqrt{2}}{1 - \sqrt{6}}$ $\frac{3 + 3\sqrt{6} + \sqrt{2} + 2\sqrt{3}}{-5}$

43. $\frac{8x^3 - 125}{1 + x^3} \div \frac{4x^2 - 25}{x^2 + 13x + 12}$ 44. $\frac{3}{x^2 - 6x - 91} + \frac{4}{x^2 - 169}$

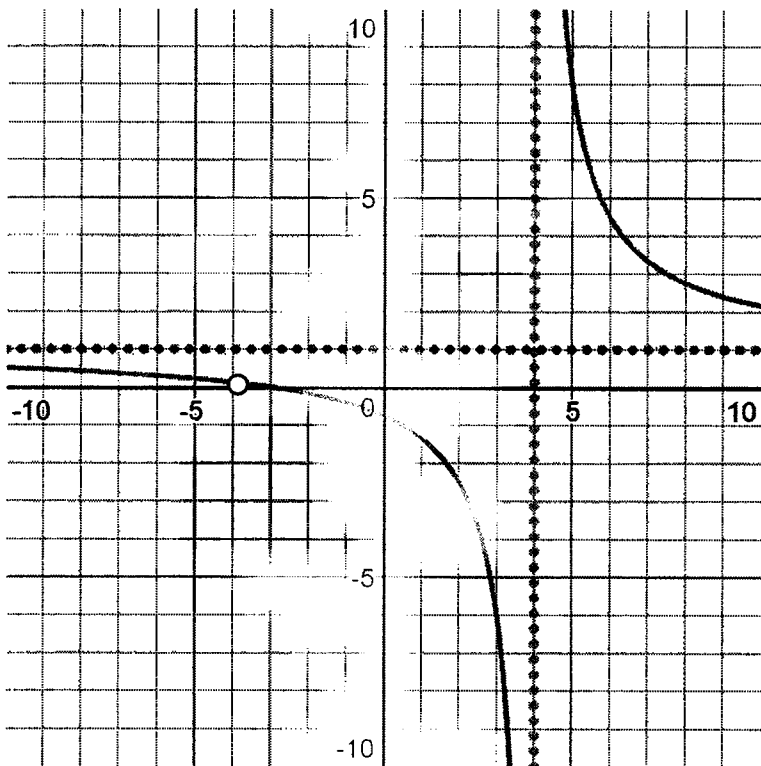
$\frac{(4x^2 + 10x + 25)(x+12)}{(x^2 - x + 1)(2x+5)}$

$\frac{7x+67}{(x-13)(x+13)(x+7)}$

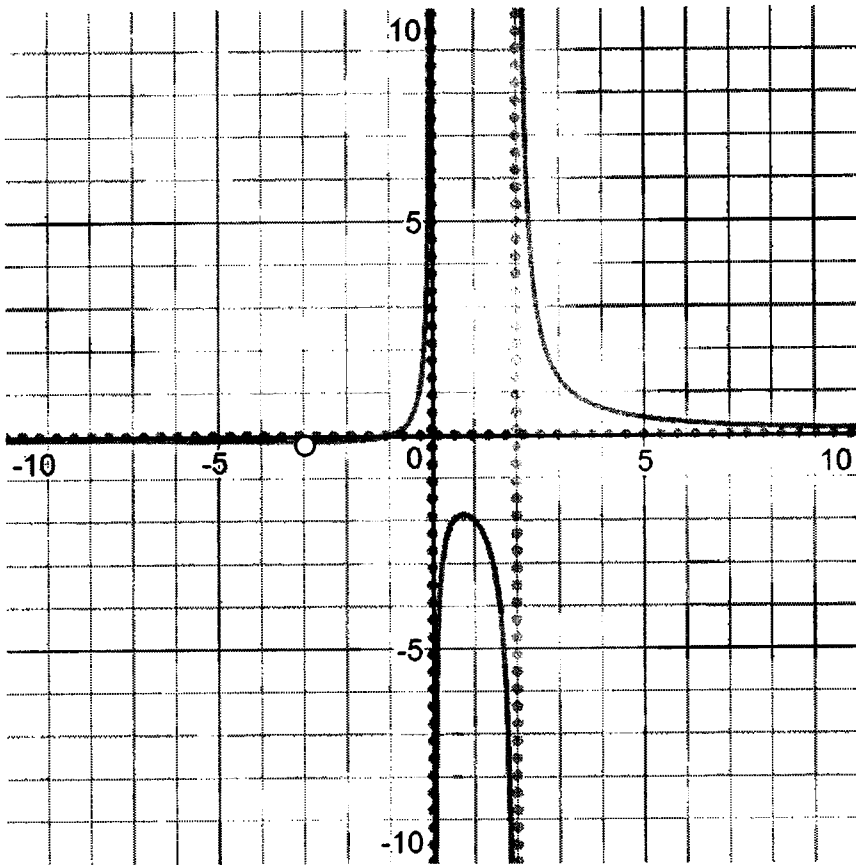
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27. Sketch the graph the function $f(x) = \frac{x^2 + 7x + 12}{x^2 - 16}$



28. Sketch the graph the function $f(x) = \frac{x^2 + 4x + 3}{x^3 + x^2 - 6x}$



30. $h(x) = -3x^3 + x^4 - 18x^2$

