

Intermediate Algebra Summative Exam #1

Answer Key

Functions Unit

- I CAN identify key characteristics and type of function from a graph, table, and equation:
 - a. Intercepts
 - b. Intervals of increasing and decreasing using interval notation
 - c. Absolute and relative min/max
 - d. Symmetry - vertical line/axis of symmetry
 - e. End behavior
 - f. Domain using interval notation when appropriate
 - g. Range using interval notation when appropriate
- I CAN sketch the functions by identifying transformations
 - a. Absolute Value
 - b. Quadratic
 - c. Cubic
 - d. Square Root
 - e. Cube Root
 - f. Piecewise
 - g. Greatest Integer (step)
- I CAN write an equation for a given function
- I CAN evaluate values of functions
- I CAN perform function operations (addition, subtraction, multiplication, division, composition)

Exponent & Polynomial Unit

- I CAN simplify and/or evaluate expressions involving exponent properties
- I CAN solve equations with same base
- I CAN add/subtract/multiply polynomials.

Factoring Unit

- I CAN Factor polynomials
 - a. GCF
 - b. Grouping
 - c. Trinomial $A = 1$
 - d. Trinomial $A \neq 1$
 - e. Difference of squares
- I CAN solve equations by factoring and using the zero product property

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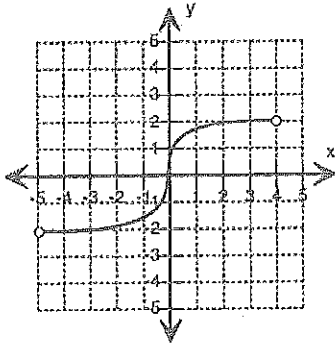
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Summative Exam 1 Review

Unit 1: Functions

State the Domain and Range for each graph.

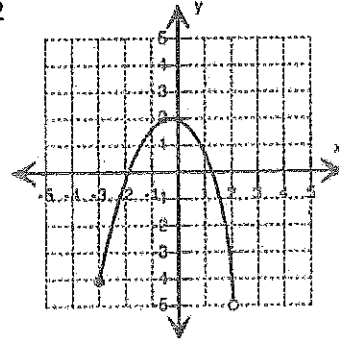
1.



Domain: $(-5, 4)$

Range: $(-2, 2)$

2.



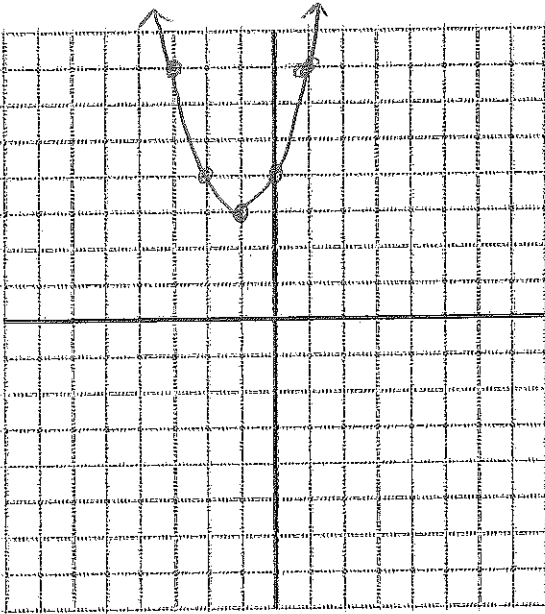
Domain: $[-3, 2]$

Range: $(-5, 2]$

Graph the following functions and identify the transformation, parent function, domain, and range.

3. $f(x) = (x + 1)^2 + 3$

4. $g(x) = \sqrt{x - 2}$

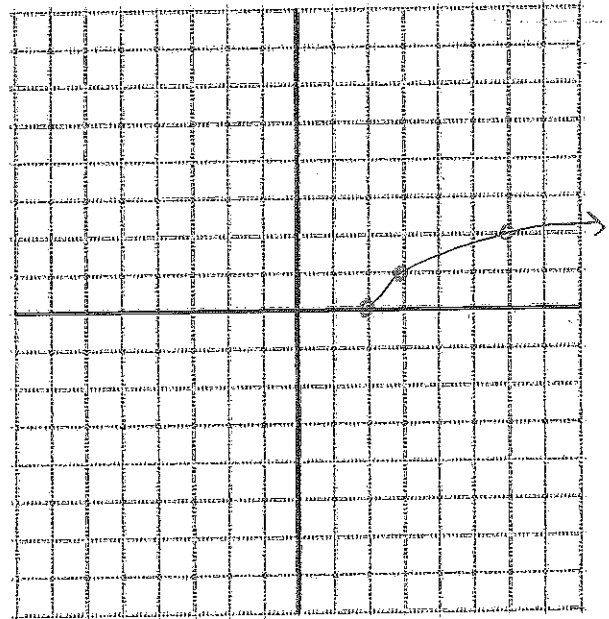


Parent Function: $y = x^2$

Transformation: left 1, up 3

Domain: $(-\infty, \infty)$

Range: $[3, \infty)$



Parent Function: $y = \sqrt{x}$

Transformation: right 2

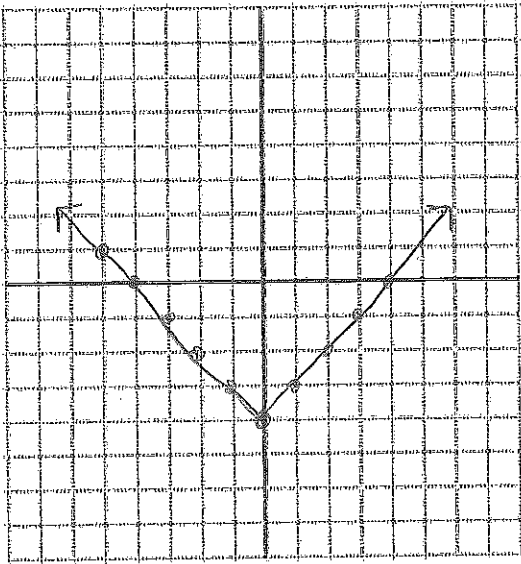
Domain: $[2, \infty)$

Range: $[0, \infty)$

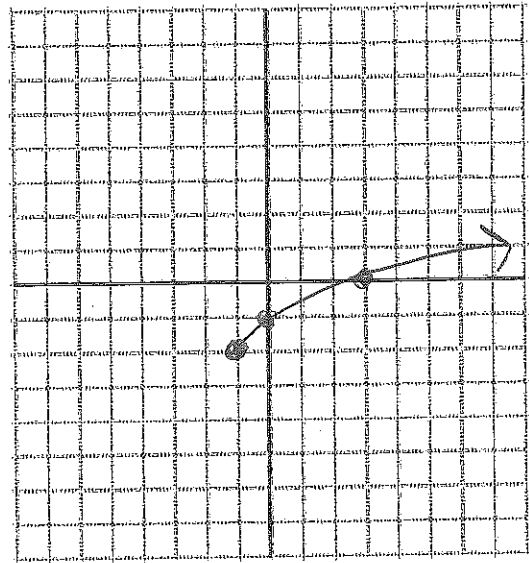
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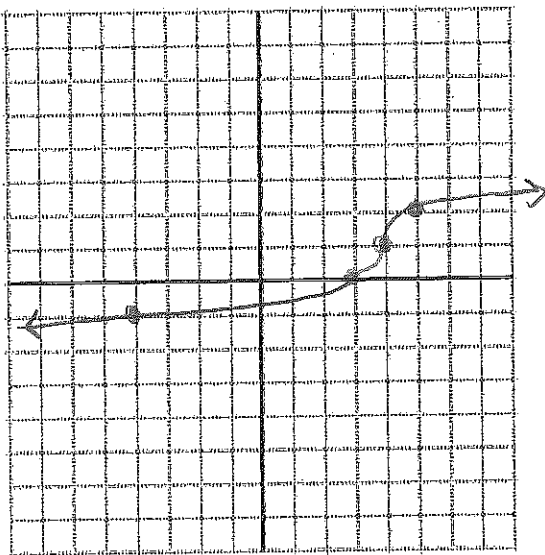
5. $h(x) = |x| - 4$



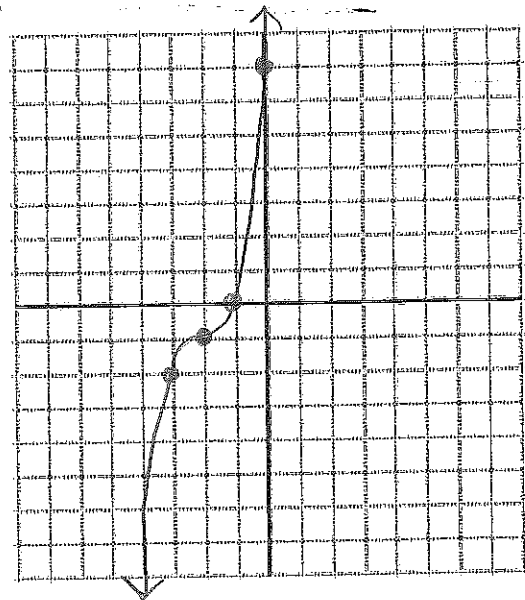
6. $g(x) = \sqrt{x+1} - 2$



7. $h(x) = \sqrt[3]{x-4} + 1$



8. $g(x) = (x+2)^3 - 1$



Given a parent function of $f(x) = 2|x|$, identify the transformations for each function below.

9. $f(x) = 2|x - 4|$

right 4

10. $f(x) = 2|x| + 8$

up 8

11. $f(x) = 2|x + 3| - 6$

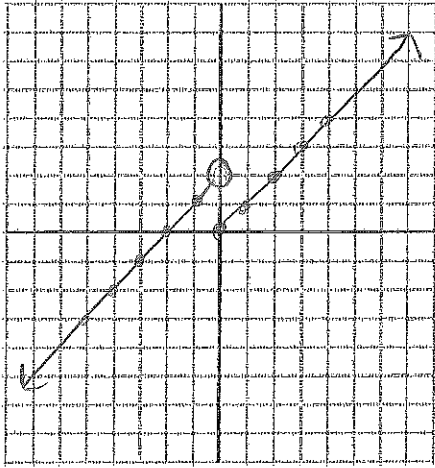
left 3, down 6

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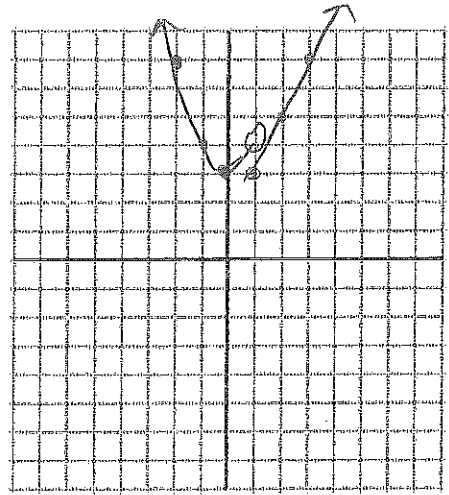
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Graph the following piecewise functions and evaluate each function at the given x-values.

$$12. f(x) = \begin{cases} x + 2, & x < 0 \\ x, & x \geq 0 \end{cases}$$



$$13. f(x) = \begin{cases} 2x + 1, & x \geq 1 \\ x^2 + 3, & x < 1 \end{cases}$$

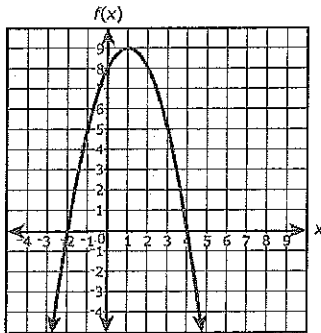


$$\begin{aligned} f(-5) &= \underline{-3} \\ f(0) &= \underline{0} \\ f(3) &= \underline{3} \\ f(14) &= \underline{14} \end{aligned}$$

$$\begin{aligned} f(-2) &= \underline{7} \\ f(0) &= \underline{3} \\ f(6) &= \underline{13} \\ f(1) &= \underline{3} \end{aligned}$$

Use the following functions to find each value.

x	h(x)
2	4
9	0
5	-1
0	2



$$g(x) = 4x - 1$$

$$14. f(h(0))$$

↓

$$f(2)$$

↓

$$8$$

$$15. (g \circ g)(x)$$

$$g(g(x))$$

$$g(4x-1)$$

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

$$16x - 4 - 1 = 16x - 5$$

$$16. \left(\frac{f}{g}\right)(-1)$$

$$\frac{f(-1)}{g(-1)} = \frac{5}{-5} = -1$$

$$17. (h - g)(5)$$

$$h(5) - g(5)$$

$$-1 - 19$$

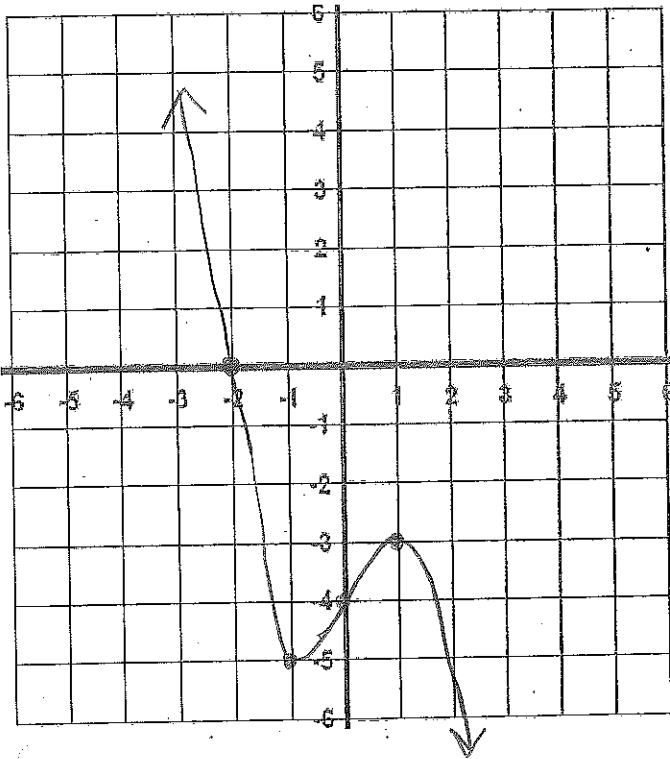
$$-20$$

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Use your calculator to sketch the graph and find the following key characteristics.

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



x-intercept(s): $(-2, 0)$

y-intercept(s): $(0, -4)$

Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

Relative Max: -3

Relative Min: -5

Interval of increasing: $(-1, 1)$

Interval of Decreasing: $(-\infty, -1) \cup (1, \infty)$

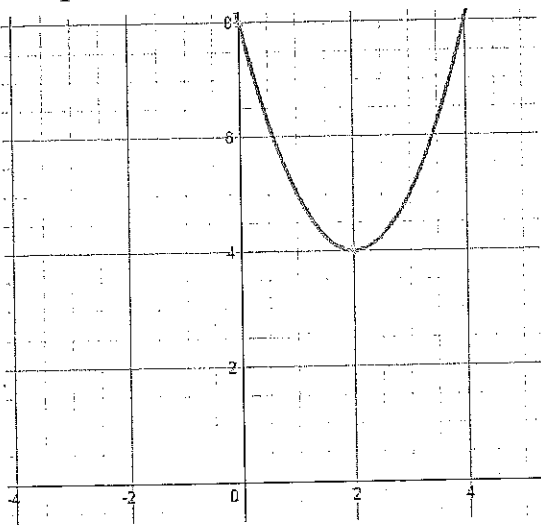
End behavior: as $x \rightarrow \infty$, $f(x) \rightarrow -\infty$

as $x \rightarrow -\infty$, $f(x) \rightarrow \infty$

Line of Symmetry: none

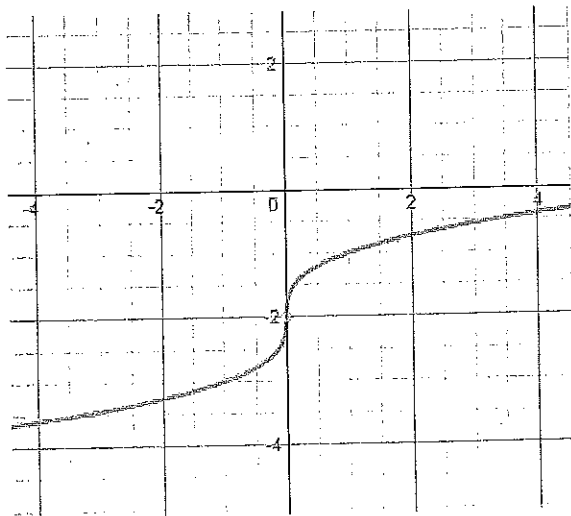
Write the equation of each graph.

19.



Equation: $y = (x-2)^2 + 4$

20.



Equation: $y = \sqrt[3]{x} - 2$

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Unit 2: Polynomials (Chapter 8)

Simplify each expression.

1. $a^7(a)(a^2)$

$$a^{10}$$

2. $(-2xy)^2(6y^8)$

$$(4x^2y^2)(6y^8)$$
$$24x^2y^{10}$$

3. $(w^3)^2(8)$

$$\left(\frac{w^6}{w^6}\right)^8$$
$$w^{48}$$

4. $(2x^3y)^4((-2y)^2)^3$

$$(16x^{12}y^4)(4y^2)^3$$
$$(16x^{12}y^4)(64y^6)$$
$$1024x^{12}y^{10}$$

5. $x^{-3}y^0z^{-2}$

$$\frac{1}{x^3z^2}$$

6. $\frac{(f^{-5}g^7)^2}{(fg)^{-6}}$

$$\frac{f^{-10}g^{14}}{f^{-6}g^{-6}}$$
$$\frac{f^6g^{20}}{f^{10}} = \frac{g^{20}}{f^4}$$

7. $\left(\frac{2rs^{3/2}}{3s^{-3}}\right)^{-2}$

$$\frac{2^{-2}r^{-2}s^{-3}}{3^{-2}s^6}$$
$$\frac{3^2}{2^2r^2s^6s^3} = \frac{9}{4r^2s^9}$$

8. $\left(\frac{26a^3}{-13a^6b^8}\right)^{-1}$

$$\frac{26^{-1}a^{-3}}{(-13)^{-1}a^{-6}b^{-8}}$$
$$\frac{-13a^6b^8}{26a^3} = \frac{-a^3b^8}{2}$$

9. $\frac{16x^6y^7z^8}{-2x^4y^4z^0}$

$$\frac{-8x^2y^3z^8}{1}$$

or

$$-8x^2y^3z^8$$

10. $\frac{x^{-3}y^7z^{-1}}{x^2y^0z^{-5}}$

$$\frac{y^7z^5}{x^5x^2z^1}$$
$$\frac{y^7z^4}{x^5}$$

$$11. 3^{-x} = (3^3)^{x+2}$$

$$\begin{array}{l} \textcircled{-x} \quad \textcircled{3x+6} \\ 3 \downarrow = 3 \downarrow \\ -x = 3x+6 \\ -4x = 6 \\ x = -1.5 \end{array}$$

$$12. 6^{5x} = 6^{x+7}$$

$$\begin{array}{l} \textcircled{5x} \quad \textcircled{x+7} \\ 6 \downarrow = 6 \downarrow \\ 5x = x+7 \\ 4x = 7 \\ x = 1.75 \end{array}$$

$$13. \frac{5^{4k+1}}{5^{3k+2}} = (5^{2k} \cdot 5^{k+3})^2$$

$$\begin{array}{l} 5^{k-1} = (5^{3k+3})^2 \\ \textcircled{k-1} \quad \textcircled{6k+6} \\ 5 \downarrow = 5 \downarrow \\ k-1 = 6k+6 \\ -5k = 7 \\ k = -1.4 \end{array}$$

$$14. 2^{2p-3} \cdot 2^{-3p} = 2^4$$

$$\begin{array}{l} \textcircled{2p-3} \quad \textcircled{4} \\ 2 \downarrow = 2 \downarrow \\ -p-3 = 4 \\ -p = 7 \\ p = -7 \end{array}$$

Find the degree of each polynomial.

$$15. a^8 b c^2 - 9 a c^2$$

11 3

deg 11

$$16. k^8 + h^9$$

8 9

deg 9

$$17. 2x^3 y^2 z + 6xy - 4z$$

6 2 1

deg 6

Simplify.

$$18. \underbrace{(a^3 - 4b^3)}_m + \underbrace{(2a^3 + 5a^2b - 6b^2 + 4b^3)}_m$$

$$3a^3 + 5a^2b - 6b^2$$

$$19. \underbrace{(2c^2 - 9)}_m - \underbrace{(4c^2 + 4c + 1)}_m$$

$$-2c^2 - 4c - 10$$

$$20. \underbrace{(4y^2 + 3y)}_m + \underbrace{(-8y^3 - 2y + 6)}_m$$

$$-8y^3 + 4y^2 + y + 6$$

$$21. 8g^2h(g^2 + 9h - 6gh - 2h)$$

$$8g^4h + 72g^2h^2 - 48g^3h^2 - 16g^2h^2$$

$$22. 5b(-b^2 + 7b - 1) + 9(3b^3 - 6b + 2)$$

$$\begin{array}{l} -5b^3 + 35b^2 - 5b + 27b^3 - 54b + 18 \\ \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \\ 22b^3 + 35b^2 - 59b + 18 \end{array}$$

$$23. 4r^2(3r - 7) + r(7r^2 - 5r + 2) - 4r^2$$

$$\begin{array}{l} 12r^3 - 28r^2 + 7r^3 - 5r^2 + 2r - 4r^2 \\ \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \\ 19r^3 - 37r^2 + 2r \end{array}$$

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Solve each equation.

$$\begin{aligned}
 24. \quad & 4(n-5) + 2 = 5(6-n) + 3n \\
 & 4n - 20 + 2 = 30 - 5n + 3n \\
 & 4n - 18 = 30 - 2n \\
 & 6n = 48 \\
 & n = 8
 \end{aligned}$$

$$\begin{aligned}
 25. \quad & 4(-6x+9) + 4 = -4(-5x+12) \\
 & -24x + 36 + 4 = 20x - 48 \\
 & -24x + 40 = 20x - 48 \\
 & -44x = -88 \\
 & x = 2
 \end{aligned}$$

Find each product.

$$\begin{array}{r}
 26. \quad (2x+7)(3x^2+8x-4) \\
 \begin{array}{r|l}
 & \begin{array}{l} 3x^2 \quad 8x \quad -4 \\ \hline 2x \quad 6x^3 \quad 16x^2 \quad -8x \\ -7 \quad -14x^2 \quad -56x \quad 28 \end{array} \\
 \hline
 & \begin{array}{l} 6x^3 + 57x^2 + 48x - 28 \end{array}
 \end{array}
 \end{array}$$

$$6x^3 + 57x^2 + 48x - 28$$

$$27. \quad (3y+2)(5y^2-2)$$

$$15y^3 - 6y + 10y^2 - 4$$

$$15y^3 + 10y^2 - 6y - 4$$

$$28. \quad (3x+1)^2 \text{ or } (3x+1)(3x+1)$$

$$9x^2 + 6x + 1$$

$$29. \quad (3x+6)(3x-6)$$

$$9x^2 - 36$$

Unit 3: Factoring (Chapter 9)

Find the GCF of the given monomials.

1. $12x^2y^4, 18y^2z$

$$6y^2$$

2. $18, 50$

$$2$$

3. $8bc, 16c^2, 28b^2c^5$

$$4c$$

Factor each expression completely.

4. $9a^2b^5 - 3ab^2 + 6ab$

$$3ab(3ab^4 - b + 2)$$

5. $(8wy + 12xy)(10wz + 15xz)$

$$4y(2w + 3x) + 5z(2w + 3x)$$

$$(2w + 3x)(4y + 5z)$$

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Factor each expression completely.

6. $7b^2 + 42b$

$$7b(b+6)$$

7. $6x^3 + 2x^2 + 12x + 4$

$$2(3x^3 + x^2 + 6x + 2)$$
$$\left\{ \begin{array}{l} x^2(3x+1) + 2(3x+1) \\ \downarrow \\ 2(3x+1)(x^2+2) \end{array} \right.$$

8. $(6y^3 - 21y^2 - 4y + 14)$

$$3y^2(2y-7) - 2(2y-7)$$
$$(2y-7)(3y^2-2)$$

9. $4x^2 - 16$

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

10. $6x^2 - 22x - 8$

$$2(3x^2 - 11x - 4)$$
$$2(3x+1)(x-4)$$

11. $x^2 - x - 56$

$$(x-8)(x+7)$$

12. $2x^2 + 3x - 20$

$$(2x-5)(x+4)$$

13. $81z^4 - 1$

$$(9z^2+1)(9z^2-1)$$
$$(9z^2+1)(3z+1)(3z-1)$$

14. $6x^3 - 14x^2 - 12x$

$$2x(3x^2 - 7x - 6)$$
$$2x(3x+2)(x-3)$$

15. $4y^2 - 20y + 25$

$$(2y-5)(2y-5)$$

or

$$(2y-5)^2$$

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Solve by factoring.

16. $x^2 + 5x + 4 = 0$

$(x+4)(x+1) = 0$

$x = -4$ $x = -1$

17. $x^2 - 5x - 24 = 0$

$(x-8)(x+3) = 0$

$x = 8$ $x = -3$

18. $8x^2 - 4x - 12 = 0$

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

$x = 1.5$ $x = -1$

19. $x^2 = 25$

$x^2 - 25 = 0$
 $(x+5)(x-5) = 0$

$x = -5$ $x = 5$

20. $a^2 - 9a - 52 = 0$

$(a+4)(a-13) = 0$

$a = -4$ $a = 13$

21. $3x^2 + 14 = 13x$

$3x^2 - 13x + 14 = 0$
 $(3x-7)(x-2) = 0$

$x = 2\frac{1}{3}$ $x = 2$

22. Find two numbers whose product is 15 such that one of the numbers is seven more than four times the other number.

$x = 1^{st} \#$
 $4x+7 = 2^{nd} \#$

$(x)(4x+7) = 15$
 $4x^2 + 7x = 15$
 $4x^2 + 7x - 15 = 0$
 $(4x-5)(x+3) = 0$

$x = 1.25$ or $x = -3$
 $1.25 \# 12$ or $-3 \# -5$

23. One number is one less than three times another number. If the product of the two numbers is 102, find the numbers.

$x = 1^{st} \#$
 $3x-1 = 2^{nd} \#$

$(x)(3x-1) = 102$
 $3x^2 - x = 102$
 $3x^2 - x - 102 = 0$
 $(3x+17)(x-6) = 0$

$x = -\frac{17}{3}$ or $x = 6$
 $-\frac{17}{3} \# -18$ or $6 \# 17$

24. An apple orchard contains 85 trees. The number of trees in each row is three less than four times the number of rows. Find the number of rows and the number of trees per row.

$x = \# \text{ of rows}$
 $4x-3 = \# \text{ of trees per row}$

$(x)(4x-3) = 85$
 $4x^2 - 3x = 85$
 $4x^2 - 3x - 85 = 0$
 $(4x+17)(x-5) = 0$

$x = -\frac{17}{4}$ or $x = 5$
no negative rows of trees
5 rows
17 trees per row

Good Luck!!!