Name __Key__

Solve for x. Check for extraneous solutions and provide restrictions where applicable.

1. $\left(\dfrac{4}{3x} - \dfrac{14x}{9} - \dfrac{5}{6x} = \dfrac{2x}{1}\right)^{18x}$

$$24 - 28x^2 - 15 = 36x^2$$
$$9 - 28x^2 = 36x^2$$
$$9 = 64x^2$$
$$\dfrac{9}{64} = x^2$$
$$x = \pm\dfrac{3}{8}$$

2. $-10(2x + 9)^2 - 13 = 267$

$$-10(2x+9)^2 = 280$$
$$(2x+9)^2 = -28$$
$$2x+9 = \pm 2i\sqrt{7}$$
$$2x = -9 \pm 2i\sqrt{7}$$
$$x = \dfrac{-9}{2} \pm i\sqrt{7}$$

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

$$(-2-x) = 4$$
$$-x = 6$$
$$x = -6$$

check:

$$\sqrt{-2 + 6} = 2$$
$$\sqrt{4} = 2 \checkmark$$

4. $\dfrac{2}{3}|4x + 5| + 2 = 2x + 6$

$$\dfrac{2}{3}|4x+5| = (2x+4)\dfrac{3}{2}$$
$$|4x+5| = 3x+6$$

$$4x+5 = 3x+6 \qquad\qquad 4x+5 = 3x-6$$
$$x = 1 \qquad\qquad\qquad 7x = -11$$
$$\qquad\qquad\qquad\qquad x = \dfrac{-11}{7}$$

$$\dfrac{2}{3}|4+5| + 2 = 2 + 6$$
$$6 + 2 = 2 + 6 \checkmark$$
$$\dfrac{2}{3}\left|-\dfrac{44}{7} + \dfrac{35}{7}\right| + 2 = \dfrac{-22}{7} + \dfrac{42}{7}$$
$$\dfrac{6}{7} + \dfrac{14}{7} = \dfrac{20}{7} \checkmark$$

5. $\dfrac{3}{10}t - 3\left(t + \dfrac{4}{3}\right) = \dfrac{1}{6}(t - 1)$

$$\dfrac{3}{10}t - 3t - 4 = \dfrac{1}{6}t - \dfrac{1}{6}$$
$$30\left(-\dfrac{27t}{10} = \dfrac{1}{6}t + \dfrac{23}{6}\right)$$
$$-81t = 5t + 115$$
$$-86t = 115$$
$$t = -\dfrac{115}{86}$$

6. $\dfrac{x - y}{z - x} + w = 2w - w$

$$\dfrac{x-y}{z-x} = \dfrac{w}{1}^{(z-x)}$$
$$x-y = wz - wx$$
$$x + wx = wz + y$$
$$x(1+w) = wz + y$$
$$x = \dfrac{wz + y}{1+w}$$

$$z \neq x \qquad w \neq -1$$

Factor the following:

7. $35x^7y^8 + 14x^2y^5 - 63x^8y^3 + 84x^5y^9$ GCF first!

$7x^2y^3(5x^5y^5 - 2y^2 - 9x^6 + 12x^3y^6)$

8. $80x^4y - 605x^2y^3$

$5x^2y(16x^2 - 121y^2)$
$5x^2y(4x - 11y)(4x + 11y)$

9. $2x^2 + 19x + 39$

$\overbrace{78}$
$6 \quad 13$

$(2x + 13)(x + 3)$

10. $x^3 + 216$

$a = x$
$b = 6$ $(x + 6)(x^2 - 6x + 36)$

11. $x^3 + 3x^2 - 4x - 12$

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

12. $4x^5 - 4xy^4 - 6x^4y + 6y^5$

GCF First

$2(2x^5 - 2xy^4 - 3x^4y + 3y^5)$
$2(2x - 3y)(x^4 - y^4)$
$2(2x - 3y)(x^2 - y^2)(x^2 + y^2)$
$2(2x - 3y)(x - y)(x + y)(x^2 + y^2)$

13. $x^2a + x^2b - 16a - 16b$

$(x^2 - 16)(a + b)$
$(x - 4)(x + 4)(a + b)$

14. $(x + 4)^2 - 10(x + 4) - 11$

let $P = (x + 4)$

$P^2 - 10P - 11$
$(P - 11)(P + 1)$
$(x + 4 - 11)(x + 4 + 1)$
$(x - 7)(x + 5)$

15. $2(2x + 1)^2 - 5(2x + 1) - 3$

-6
$-6 + 1$

Let $B = 2x+1$

$2B^2 - 5B - 3$

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

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

$(4x+3)(2x-2)$

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

16. $(x^2 + 5x - 24)^2 - (x^2 + 5x - 24) - 6$

let $C = x^2+5x-24$

$C^2 - C - 6$

$(C-3)(C+2)$

$(x^2+5x-24-3)(x^2+5x-24+2)$

$(x^2+5x-27)(x^2+5x-22)$

Write the expression as a complex number in standard form.

17. $3i(-6 - 2i) - 7(3 + 2i) + 5i\left(-4 + 10i^3\right)$

$-10i$

$= -18i + 6 - 21 - 14i - 20i + 50$

$= 35 - 52i$

18. $\dfrac{-6 - 8i}{2i^9}$

$i^9 = i$

$= \dfrac{(-3-4i)i}{i \cdot i}$

$= \dfrac{-3i+4}{-1}$

$= -4 + 3i$

19. $\dfrac{(3 - 7i)(-5-3i)}{(-5 + 3i)(-5-3i)}$

$= \dfrac{-15-9i+35i-21}{25+9}$

$= \dfrac{-36+26i}{34}$

$= \dfrac{-18}{17} + \dfrac{13i}{17}$

20. $4i(2 + 5i)(1 + 3i)$

$= 4i(2+11i-15)$

$= 4i(-13+11i)$

$= -52i - 44$

$= -44 - 52i$

21. If $r = 4$, $p = -1$, and $q = 2$, evaluate $\dfrac{(rp)^2 - pq + 3}{(r - p + q)^2}$.

$\dfrac{(4(-1))^2 - (-1\cdot2) + 3}{(4-(-1)+2)^2} = \dfrac{16+2+3}{7^2}$

$= \dfrac{21}{49}$

$= \dfrac{3}{7}$

22. Each day, Andy's Ice Cream Shop sells twice as many double-scoop ice cream cones, at $2.50 a cone, as single-scoop ice cream cones, at $1.50 a cone. If Andy's Ice Cream Shop sells 300 double-scoop cones on Monday, how much money did customers spend on single-scoop and double-scoop cones?

$$Sells \ 300 \ double \ scoop$$
$$150 \ single \ scoop$$

$$300(2.50) + 150(1.50)$$

The customers spent a total of $975.00 on ice cream cones.

23. If a 12-foot pole casts a 4.8-foot shadow, how tall is a pole that casts an 8-foot shadow?

$$\frac{12}{4.8} = \frac{x}{8}$$
$$4.8x = 96$$
$$x = 20 \ ft$$

24. Simplify the following radicals

a. $\sqrt{98} = \sqrt{49 \cdot 2}$
$$= 7\sqrt{2}$$

b. $\sqrt{108} = \sqrt{4 \cdot 27}$
$$= \sqrt{4 \cdot 9 \cdot 3}$$
$$= 2 \cdot 3\sqrt{3}$$
$$= 6\sqrt{3}$$

c. $\sqrt{320} = \sqrt{4 \cdot 80}$
$$= \sqrt{4 \cdot 4 \cdot 20}$$
$$= \sqrt{4 \cdot 4 \cdot 4 \cdot 5}$$
$$= 2 \cdot 2 \cdot 2\sqrt{5}$$
$$= 8\sqrt{5}$$

d. $\sqrt{2700} = \sqrt{100 \cdot 27}$
$$= \sqrt{100 \cdot 9 \cdot 3}$$
$$= 10 \cdot 3\sqrt{3}$$
$$= 30\sqrt{3}$$