Calculus Equations Practice #3

Solve:

1. $5\sqrt{x} = 3\sqrt{x + 16}$

2. $x - 3\sqrt{x} = 130$

3. $8x = 6\sqrt{x} - 1$

4. $\sqrt{x^2 - 24} + x + 2 = 0$

5. $2\sqrt{x - 6} = 30 - x$

6. $5\sqrt{2x + 1} + 19 = x$

7. $x - \sqrt{x - 17} = 20$

8. $x + \sqrt{x - 17} = 20$

Solve for x in terms of k:

9. $\sqrt{x} = 3\sqrt{2x + k}$

10. $\sqrt{2x + k} = x$

Solve:

11. $\dfrac{x + 5}{x - 7} = 7$

12. $\dfrac{3x - 1}{x + 3} = x - 5$

13. $\dfrac{x^2 - 1}{x + 1} = 2x - 11$

14. $\dfrac{x + 10}{x - 3} = \dfrac{5 - 7x}{2x - 14}$

Solve the inequations:

15. $x^2 - 2x - 48 < 0$

16. $x^2 + 7x + 15 < 8x + 45$

Answers: Calculus Equations Practice #3

NB: invalid solutions are shown crossed out

1. $5\sqrt{x} = 3\sqrt{x+16}$ $(5\sqrt{x})^2 = (3\sqrt{x+16})^2$ $25x = 9x + 144$ $x = 9$

2. $x - 3\sqrt{x} = 130$ $(x-130)^2 = (3\sqrt{x})^2$ $x^2 - 269x + 16900 = 0$ $x = 169$ ~~or 100~~

3. $8x = 6\sqrt{x} - 1$ $(8x + 1)^2 = (6\sqrt{x})^2$ $64x^2 - 20x + 1 = 0$ $x = \frac{1}{4}$ or $\frac{1}{16}$

4. $\sqrt{x^2 - 24} + x + 2 = 0$ $(x + 2)^2 = (\sqrt{x^2 - 24})^2$ $x^2 + 4x + 4 = x^2 - 24$ $x = {}^-7$

5. $2\sqrt{x-6} = 30 - x$ $(2\sqrt{x-6})^2 = (30 - x)^2$ $x^2 - 64x + 924 = 0$ $x = 22$ ~~or 42~~

6. $5\sqrt{2x+1} + 19 = x$ $(5\sqrt{2x+1})^2 = (x - 19)^2$ $x^2 - 88x + 336 = 0$ $x = 84$ ~~or 4~~

7. $x - \sqrt{x-17} = 20$ $(x-20)^2 = (\sqrt{x-17})^2$ $x^2 - 41x - 383 = 0$ $x = 22.3$ ~~or 18.7~~

8. $x + \sqrt{x-17} = 20$ $(x-20)^2 = ({}^-\sqrt{x-17})^2$ $x^2 - 41x - 383 = 0$ $x = 18.7$ ~~or 22.3~~

Solve for x in terms of k:

9. $\sqrt{x} = 3\sqrt{2x+k}$ $(\sqrt{x})^2 = (3\sqrt{2x+k})^2$ $x = 18x + 9k$ $x = \frac{-9k}{17}$

10. $\sqrt{2x+k} = x$ $2x + k = x^2$ $k + 1 = (x - 1)^2$ $x = \sqrt{k+1} + 1$

                $k \geq {}^-1$ for real solutions (although imaginary solutions for $k < {}^-1$ work as well).

Solve

11. $\dfrac{x+5}{x-7} = 7$ $x + 5 = 7x - 49$ $54 = 6x$ $x = 9$

12. $\dfrac{3x-1}{x+3} = x - 5$ $3x - 1 = (x - 5)(x + 3)$ $x^2 - 5x - 14 = 0$ $x = {}^-2$ or 7

13. $\dfrac{x^2 - 1}{x+1} = 2x - 11$ $x^2 - 1 = 2x^2 - 9x - 11$ $x^2 - 9x - 10 = 0$ $x = 10$ ~~or ⁻1~~

14. $\dfrac{x+10}{x-3} = \dfrac{5-7x}{2x-14}$ $2x^2 + 6x - 140 = {}^-7x^2 + 26x - 15$ $x = 5$ or $\dfrac{-25}{9}$

Solve the inequations

15. $x^2 - 2x - 48 < 0$ $(x - 8)(x + 6) < 0$ $+ - < 0$ and $- + < 0$ ${}^-6 < x < 8$

16. $x^2 + 7x + 15 < 8x + 45$ $x^2 - x - 30 < 0$ $(x - 6)(x + 5) < 0$ $x < {}^-5$ or $x > 6$