## Calculus Equations Practice #2

**Solve:**

1. $\sqrt{2x + 1} = x - 1$

2. $5\sqrt{x - 6} = \dfrac{x + 10}{2}$

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

4. $3\sqrt{x - 5} = 75 - 2x$

5. $\sqrt{x^2 + 63} = 4\sqrt{x}$

6. $3x - 5\sqrt{x} = 2$

7. $3x = \sqrt{x + 1} + 4$

8. $x - \sqrt{x + 12} = 10$

**Solve for $x$ in terms of $k$:**

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

10. $k\sqrt{x} = \sqrt{x + 4}$

**Solve**

11. $\dfrac{x + 2}{1 - x} = 5$

12. $\dfrac{x + 17}{x + 2} = x + 1$

13. $\dfrac{2x + 2}{x - 8} = \dfrac{12x + 1}{x + 1}$

**Solve the inequations**

14. $x^2 + 12x + 32 < 0$

15. $x^2 + 40 > 12x + 4$

16. $\dfrac{1}{x + 4} > \dfrac{x}{x - 2}$

# Answers: Calculus Equations Practice #2

**NB: invalid solutions are shown crossed out**

1. $\sqrt{2x+1} = x-1$      $(\sqrt{2x+1})^2 = (x-1)^2$    $x^2 - 4x = 0$        $x = 4$ ~~or 0~~

2. $5\sqrt{x-6} = \dfrac{x+10}{2}$    $(10\sqrt{x-6})^2 = (x+10)^2$   $x^2 - 80x + 700 = 0$     $x = 70$ or $10$

3. $2x = \sqrt{x} + 3$      $(2x-3)^2 = (\sqrt{x})^2$      $4x^2 - 13x + 9 = 0$     $x = 2.25$ ~~or 1~~

4. $3\sqrt{x-5} = 75 - 2x$    $(3\sqrt{x-5})^2 = (75-2x)^2$   $4x^2 - 309x + 5670 = 0$   $x = 30$ ~~or 47.25~~

5. $\sqrt{x^2+63} = 4\sqrt{x}$      $(\sqrt{x^2+63})^2 = (4\sqrt{x})^2$    $x^2 - 16x + 63 = 0$      $x = 7$ or $9$

6. $3x - 5\sqrt{x} = 2$      $(3x-2)^2 = (5\sqrt{x})^2$     $9x^2 - 37x + 4 = 0$      $x = 4$ ~~or $\frac{1}{9}$~~

7. $3x = \sqrt{x+1} + 4$      $(3x-4)^2 = (\sqrt{x+1})^2$    $9x^2 - 25x + 15 = 0$      $x = 1.901$ ~~or 0.88~~

8. $x - \sqrt{x+12} = 10$      $(x-10)^2 = (\sqrt{x+12})^2$    $x^2 - 21x + 88 = 0$      $x = 15.216$ ~~or 5.8~~

**Solve for $x$ in terms of $k$:**

9. $\sqrt{x+k} = 3\sqrt{x}$      $(\sqrt{x+k})^2 = (3\sqrt{x})^2$     $x + k = 9x$      $x = \dfrac{k}{8}$

10. $k\sqrt{x} = \sqrt{x+4}$      $k^2 x = x + 4$      $x(k^2 - 1) = 4$      $x = \dfrac{4}{k^2 - 1}$   $k > 1$

**Solve**

11. $\dfrac{x+2}{1-x} = 5$      $x + 2 = 5 - 5x$      $6x = 3$      $x = \frac{1}{2}$

12. $\dfrac{x+17}{x+2} = x + 1$      $x + 17 = x^2 + 3x + 2$    $x^2 + 2x - 15 = 0$      $x = {}^-5$ or $3$

13. $\dfrac{2x+2}{x-8} = \dfrac{12x+1}{x+1}$      $2x^2 + 4x + 2 = 12x^2 - 95x - 8$      $x = 10$ or $\dfrac{-1}{10}$

**Solve the inequations**

14. $x^2 + 12x + 32 < 0$      $(x+8)(x+4) < 0$    $+ - < 0$ and $- + < 0$    ${}^-4 < x < {}^-8$

15. $x^2 + 40 > 12x + 4$      $x^2 - 12x + 36 > 0$    $(x-3)(x-3) > 0$      $x \ne 6$

16. $\dfrac{1}{x+4} > \dfrac{x}{x-2}$      $x - 2 > x^2 + 4x$ if ${}^-4 < x < 2$     $(x+1)(x+2) < 0$ etc

                but $x - 2 < x^2 + 4x$ otherwise     so ${}^-4 < x < {}^-2$ or ${}^-1 < x < 2$