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HW Pre Calculus 12 Section 2.3 Solving Radical Functions:

1. What does it mean when an equation has an extraneous root?
   The equation gives 2 answers when solved, however one answer does not fit the original equation

2. Is an extraneous root also a solution? YES or NO ?? Explain:
   No. The extraneous root is only a solution for the reciprocal graph.

3. For what values of "k" will the function not have any solutions? Explain: $\sqrt{ax+b}=k$
   $k \geq 0$ k cannot be negative as square roots must always have a positive answer

4. For what values of "k" will the function not have any solutions? Explain: $\sqrt{ax^2 \pm b}=k$
   Refer to #3.

5. How do we check for extraneous roots? Explain:
   Plug the solutions back into the original equation and verify if it fits the equation. If it doesn't, the answer is extraneous. You can also graph it out

6. Why do extraneous roots exist? Explain:
   When you square an equation to find the solution, you find the solutions for both $\pm\sqrt{}$

7. Which of the following functions will have an extraneous root? Explain:

i) $\sqrt{5x^2-3x}+2=0$
$\sqrt{5x^2-3x} = -2$
NRA

ii) $\sqrt{8-3x^2}+2=3$
$\sqrt{8-3x^2} = 1$

iii) $\sqrt{-9x^2+20}+8=7$
$\sqrt{-9x^2+20} = -1$
NRA

8. How do you tell whether if a square root function is either a semi circle or a semi-hyperbola? Explain:
   Semi circle's stem from parabola's opening down whereas a semi-hyperbola stems from a parabola opening up.

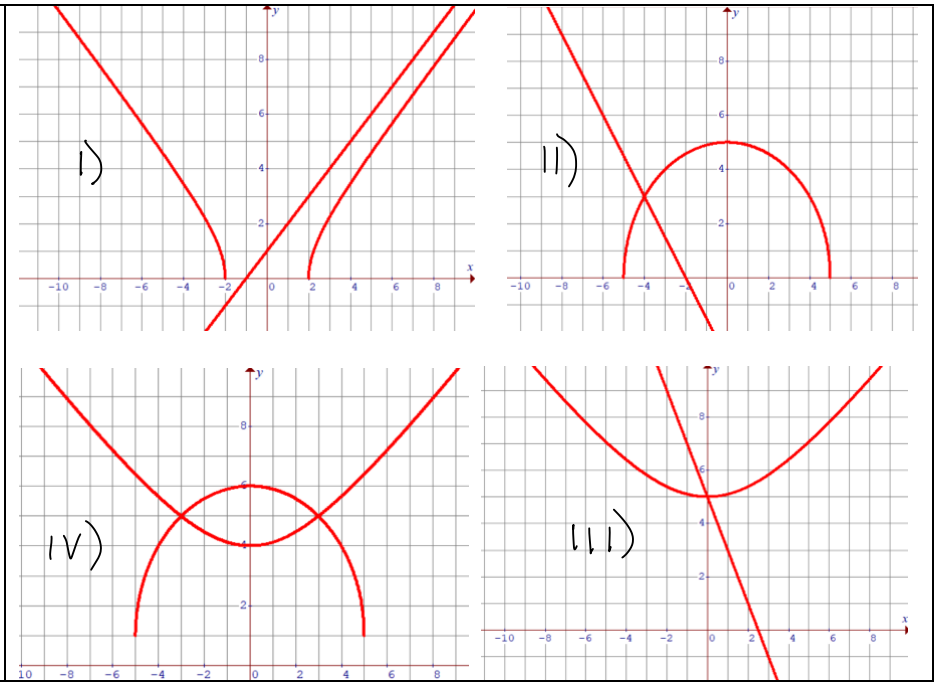
9. Match each equation with the graph that corresponds with it:

I $\sqrt{x^2-4}=x+1$

II) $\sqrt{25-x^2}=\frac{-3}{2}(x+4)+3$

iii) $\sqrt{25+x^2}=-2x+5$

iv) $\sqrt{x^2+16}=\sqrt{25-x^2}+1$



Solve the following equations for "x", check for extraneous roots:

a) $\sqrt{9-x^2}=x+3$

$9-x^2=(x+3)^2$

$9-x^2=x^2+6x+9$

$0=2x^2+6x$

$0=2x(x+3)$

$2x=0 \rightarrow x_1=0$

$x+3=0 \rightarrow x_2=-3$

CHECK

$\sqrt{9-(0)^2}=0+3$

$\sqrt{9}=3$ ✓

$\sqrt{9-(-3)^2}=-3+3$

$\sqrt{9-9}=0$ ✓

b) $\sqrt{16-x^2}=-x+4$

$16-x^2=(-x+4)^2$

$16-x^2=x^2-8x+16$

$0=2x^2-8x$

$0=2x(x-4)$

$2x=0 \rightarrow x_1=0$

$x-4=0 \rightarrow x=4$

CHECK

$\sqrt{16-(0)^2}=-0+4$

$\sqrt{16}=4$ ✓

$\sqrt{16-(4)^2}=-4+4$

$\sqrt{16-16}=0$

$\sqrt{0}=0$ ✓

c) $\sqrt{25-x^2}=7-x$

$25-x^2=(7-x)^2$

$25-x^2=x^2-14x+49$

$0=2x^2-14x+24$

$0=2(x^2-7x+12)$ (12 = −4 × −3, −7 = −4 + −3)

$0=2(x-4)(x-3)$

$x_1=4$

$x_2=3$

CHECK

$\sqrt{25-(4)^2}=7-4$

$\sqrt{25-16}=3$

$\sqrt{9}=3$ ✓

$\sqrt{25-(3)^2}=7-3$

$\sqrt{25-9}=4$

$\sqrt{16}=4$ ✓

d) $\sqrt{x^2-9}=0.5x+6.5$

$\sqrt{x^2-9}=\frac{1}{2}(x+13)$

$2\sqrt{x^2-9}=x+13$

$4(x^2-9)=(x+13)^2$

$4x^2-36=x^2+26x+169$

$3x^2-26x-205=0$ (−615 = −41 × 15, −26 = −41 + 15)

$\left(\frac{3x-41}{1}\right)\left(\frac{3x+15}{3}\right)=0$

$(3x-41)(x+5)$

$x+5=0 \rightarrow x_1=-5$

$3x-41=0 \rightarrow x_2=\frac{41}{3}$

CHECK

$\sqrt{(-5)^2-9}=0.5(-5)+6.5$

$\sqrt{25-9}=-2.5+6.5$

$\sqrt{16}=4$ ✓

$\sqrt{\left(\frac{41}{3}\right)^2-9}=0.5\left(\frac{41}{3}\right)+6.5$

$\sqrt{\frac{1681}{9}-\frac{81}{9}}=\frac{41}{6}+\frac{39}{6}$

$\sqrt{\frac{1600}{9}}=\frac{40}{3}$ ✓

e) $\sqrt{(x-2)^2-25}=0.5x+2$

$\sqrt{x^2-4x+4-25} = \frac{1}{2}(x+4)$

$2\sqrt{x^2-4x-21} = x+4$

$4(x^2-4x-21) = (x+4)^2$

$4x^2-16x-84 = x^2+8x+16$

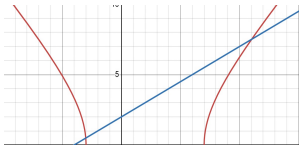
$3x^2-24x-100$

$x = \frac{24 \pm \sqrt{576+1200}}{6}$

$x = \frac{24 \pm \sqrt{1776}}{6}$

$x_1 = \frac{24+\sqrt{1776}}{6} \quad x_2 = \frac{24-\sqrt{1776}}{6}$

CHECK



Both are correct

f) $\sqrt{x^2+4}=-3x+2$

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

$x^2+4 = 9x^2-6x+4$

$0 = 8x^2-6x$

$0 = 2x(4x-3)$

$2x=0 \rightarrow x_1 = 0$

$4x-3=0 \rightarrow x_2 = \frac{3}{4}$ extraneous root

CHECK

$\sqrt{(0)^2+4} = -3(0)+2$

$\sqrt{4} = 2$ ✓

$\sqrt{(\frac{3}{4})^2+4} = -3(\frac{3}{4})+2$

$\sqrt{(\frac{3}{4})^2+4} = -\frac{9}{4}+\frac{8}{4}$

$\sqrt{\frac{9}{16}+4} \neq -\frac{1}{4}$ ✗

g) $\sqrt{x^2-4x+13}=\frac{3}{2}x+8$

$\sqrt{x^2-4x+13} = \frac{3}{2}(x+\frac{16}{3})$

$\frac{4}{9}(x^2-4x+13) = (x+\frac{16}{3})^2$

$\frac{4}{9}x^2-\frac{16}{9}x+\frac{52}{9} = x^2+\frac{32}{3}x+\frac{256}{9}$

$0 = \frac{5}{9}x^2+\frac{112}{9}x+\frac{204}{9}$

$0 = 5x^2+112x+204$

$x = \frac{-112 \pm \sqrt{12544-4080}}{10}$

$x = \frac{-112 \pm 92}{10}$

$x_1 = -2$

$x_2 = -20.4$ extraneous root

CHECK

$\sqrt{(-2)^2-4(-2)+13} = \frac{3}{2}(-2)+8$

$\sqrt{4+8+13} = -3+8$

$\sqrt{25} = 5$ ✓

$\sqrt{(-20.4)^2-4(-20.4)+13} = \frac{3}{2}(-20.4)+8$

$\sqrt{416.16+81.6+13} = 30.6+8$

$\sqrt{510.76} \neq 38.6$ ✗

h) $\sqrt{x^2+2x+26}=\frac{-2}{5}(x+1)+5$

$\sqrt{x^2+2x+26} = -\frac{2}{5}x-\frac{2}{5}+\frac{25}{5}$

$x^2+2x+26 = (-\frac{2}{5}x+\frac{23}{5})^2$

$x^2+2x+26 = \frac{4}{25}x^2-\frac{92}{25}x+\frac{529}{25}$

$\frac{21}{25}x^2+\frac{142}{25}x+\frac{121}{25} = 0$

$21x^2+142x+121 = 0$

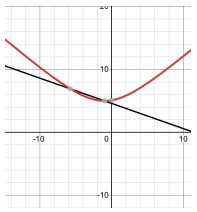
$x = \frac{-142 \pm \sqrt{20164-10164}}{42}$

$x = \frac{-14 \pm 100}{42}$

$x_1 = -1$

$x_2 = -\frac{242}{42}$

CHECK



Both are right

i) $\sqrt{25-4(x-1)^2}=-(x-1)+5$

$\sqrt{25-4(x-1)^2} = -x+6$

$25-4(x-1)^2 = (-x+6)^2$

$25-4(x^2-2x+1) = x^2-12x+36$

$25-4x^2+8x-4 = x^2-12x+36$

$-4x^2+8x+21 = x^2-12x+36$

$0 = 5x^2-20x+15$

$0 = x^2-4x+3$ (3, −1, −3, −4)

$0 = (x-1)(x-3)$

$x-1=0 \rightarrow x_1 = 1$

$x-3=0 \rightarrow x_2 = 3$

CHECK

$\sqrt{25-4(1-1)^2} = -(1-1)+5$

$\sqrt{25} = 5$ ✓

$\sqrt{25-4(3-1)^2} = -(3-1)+5$

$\sqrt{25-16} = 3$

$\sqrt{9} = 3$ ✓

j) $\sqrt{-5x^2+20x+16}=2x-4$

$-5x^2+20x+16 = (2x-4)^2$

$-5x^2+20x+16 = 4x^2-16x+16$

$0 = 9x^2-36x$

$0 = 9x(x-4)$

$x_1 = 0$ extraneous root

$x_2 = 4$

CHECK

$\sqrt{0+0+16} = 0-4$

$\sqrt{16} \neq -4$ ✗

$\sqrt{-5(4)^2+20(4)+16} = 2(4)-4$

$\sqrt{-80+80+16} = 8-4$

$\sqrt{16} = 4$ ✓

k) $\sqrt{9-(x+1)^2}=0.5x-5$

$9-(x+1)^2 = (\frac{1}{2}x-5)^2$

$9-(x^2+2x+1) = (\frac{1}{4}x^2-5x+25)$

$9-x^2-2x-1 = \frac{1}{4}x^2-5x+25$

$0 = \frac{5}{4}x^2-3x+17$

$x = \frac{3 \pm \sqrt{9-85}}{\frac{5}{2}}$

NO REAL ANSWER

L) $\sqrt{x^2+16}=-\sqrt{25-x^2}$

NO REAL ANSWER