Question 23 1 mark 115

Given $f(x)=\frac{1}{2}x-3$, state the coordinates of an invariant (unchanged) point when sketching the graph of $y=\sqrt{f(x)}$.

9b) $x = \sqrt{4-x} + 2$

$$(x-2)^2 = \left(\sqrt{4-x}\right)^2$$

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

$$x^2 - 4x \cancel{+4} + x \cancel{-4} = 0$$

$$x^2 - 3x = 0$$

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

$\cancel{x = 0}$ NOT the solution

$X = 3$ ✓

Therefore $X = 3$ is the solution.

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Solution

$$\left(3\sqrt{2x+1}\right)^2 = (x+4)^2$$

$$9(2x+1) = x^2 + 8x + 16$$

$$18x + 9 = x^2 + 8x + 16$$

$$0 = x^2 + 8x + 16 - 18x - 9$$

$$0 = 1x^2 - 10x + 7$$

so we can use the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{10 \pm \sqrt{100 - 28}}{2}$$

$$x = \frac{10 \pm \sqrt{72}}{2}$$

$$x = \frac{10 + \sqrt{72}}{2} \quad \text{or} \quad x = \frac{10 - \sqrt{72}}{2}$$

$$x = \frac{10 + \sqrt{36}\sqrt{2}}{2} \qquad x = \frac{10 - 6\sqrt{2}}{2}$$

$$x = \frac{10 + 6\sqrt{2}}{2}$$

$$x = \frac{\cancel{2}(5 + 3\sqrt{2})}{\cancel{2}}$$

$$\boxed{x = 5 + 3\sqrt{2}} \qquad \boxed{x = 5 - 3\sqrt{2}}$$

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9d)

$$\left(1+\sqrt{x-3}\right)^2=\left(\sqrt{2x-6}\right)^2$$

$$1+2\sqrt{x-3}+(x-3)=2x-6$$

$$2\sqrt{x-3}+x-2=2x-6$$

$$2\sqrt{x-3}=2x-6-x+2$$

$$\left(2\sqrt{x-3}\right)^2=(x-4)^2$$

$$4(x-3)=x^2-8x+16$$

$$4x-12=x^2-8x+16$$

$$0=x^2-8x+16-4x+12$$

$$0=x^2-12x+28$$

+28

1	28
2	14
-14	-2
4	7
-4	-7

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{12\pm\sqrt{144-112}}{2}$$

$$\begin{array}{r} \overset{3}{2}8 \\ \times\ 4 \\ \hline 112 \end{array}$$

$$x=\frac{12\pm\sqrt{32}}{2}$$

$$x=\frac{12\pm4\sqrt{2}}{2}$$

$$x=\frac{\cancel{4}^{\,2}(3\pm\sqrt{2})}{\cancel{2}}=\boxed{2(3\pm\sqrt{2})}$$