4^{th} exercise:

1) $OS = x-2$; OS represents the measure of segment [OS].
So, OS exists if $x-2>0$
$\therefore$ $x>2$ that is to say for all real values of x strictly greater than zero.

2) a- Apply Pythagorean theorem in right $\triangle$ SOR:

$OR^2 = SO^2 + SR^2$
then, $SR^2 = OR^2 - OS^2$.
$= (2x-1)^2 - (x-2)^2$
$= [(2x-1)-(x-2)][(2x-1)+(x-2)]$
$= (x+1)(3x-3)$
$= 3(x+1)(x-1)$
$\therefore$ $\boxed{SR^2 = 3(x^2-1)}$.

b) For, $SR = 3$
then $3^2 = 3(x^2-1)$
$3 = x^2-1$.
$x^2 = 4$
$x = \mp 2$ which are rejected since $x > 2$
$\therefore$ NO, at $SR = 3$ all values of x are rejected.

c- $A(x) = \frac{\text{base} \times \text{height}}{2} = \frac{SR \times SO}{2} = \frac{(x-2)\sqrt{3(x^2-1)}}{2}$.

d- $A(x) = \frac{\text{base} \times \text{height}}{2} = \frac{SH \times RO}{2} = \frac{SH \times (2x-1)}{2}$.