

11.  $S = x^2 + \frac{1}{x^2}$  on  $[\frac{1}{2}, 3]$

We know from before that  
critical points occur at  $x = 1$

$$S' = 2x - \frac{2}{x^3} = 0 \Rightarrow 2 \left( \frac{x^4 - 1}{x^3} \right) = 0 \Rightarrow x = \pm 1$$

But  $x = -1$  is not in the domain.

$$S(1) = 1^2 + \frac{1}{1^2} = 2$$

$$S\left(\frac{1}{2}\right) = \left(\frac{1}{2}\right)^2 + \frac{1}{\left(\frac{1}{2}\right)^2} = \frac{1}{4} + \frac{1}{\frac{1}{4}} = 4\frac{1}{4}$$

$$S(3) = \left(\frac{1}{3}\right)^2 + \underline{3}^2 = 9 + \frac{1}{9} = 9\frac{1}{9}$$

Global max is at  $(3, 9\frac{1}{9})$

Global min is at  $(\frac{1}{2}, 4\frac{1}{4})$ .