$(x-1)(x-1)$

What you'll Learn About
Critical Points/Extreme Values

Find the critical points

1) $\frac{dy}{dx} = 0$

Critical points are possible local max/min values

8) $y = \frac{1}{x-1} - \frac{1}{x}$

$y = (x-1)^{-1} - x^{-1}$

$\frac{dy}{dx} = -(x-1)^{-2} + x^{-2}$

$0 = \frac{-1(x^2)}{(x-1)^2(x^2)} + \frac{1}{x^2}\frac{(x-1)^2}{(x-1)^2}$

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

$0 = -2x + 1$

$+2x \quad +2x$

$\frac{2x}{2} = \frac{1}{2}$ $x = \frac{1}{2}$

Critical point

12) $f(x) = 4x - \sqrt{x+1}$

$f(x) = 4x - (x+1)^{1/2}$

$f'(x) = 4 - \frac{1}{2}(x+1)^{-1/2}$

$0 = 4 - \frac{1}{2\sqrt{x+1}}$

$+\frac{1}{2\sqrt{x+1}} \quad + \frac{1}{2\sqrt{x+1}}$

$\cancel{2\sqrt{x+1}}\ \frac{1}{\cancel{2\sqrt{x+1}}} = 4 \cdot 2\sqrt{x+1}$

$\frac{1}{8} = \frac{8\sqrt{x+1}}{8}$

$\left(\frac{1}{8}\right)^2 = \left(\sqrt{x+1}\right)^2$

$\frac{1}{64} = x + 1$

$\frac{1}{64} - 1 = x$

Critical pt

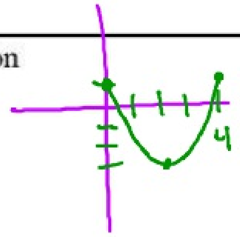
$x = -\frac{63}{64}$

Extreme Values

- Critical Points
- Plug the C.P. and the endpts of interval into $f(x)$

Determine the extreme values of each function

21) $\boxed{f(x)=x^2-4x+1}$ on $[0,4]$



$f'(x) = 2x-4$

$0 = 2x-4$

$2 = x$

Critical point

$f(0) = 1$

$f(2) = -3$

$f(4) = 1$

Extreme Values

$(0,1)$ and $(4,1)$ Abs Max

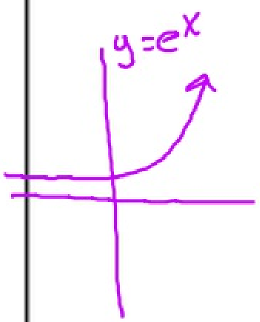
$(2,-3)$ Abs Min

Abs Max

$(\ln 1.5, 2.25)$

Abs Min

$(1, 3e-e^2)$



56) $f(x)=3e^x - e^{2x}$ on $[-.5,1]$

$f(x) = 3e^x - e^{2x}$

$f'(x) = 3e^x - 2e^{2x}$

$0 = 3e^x - 2e^{2x}$

$0 = e^x(3-2e^x)$

$e^x \neq 0 \quad 3-2e^x = 0$

$\frac{3}{2} = \frac{2e^x}{2}$

$1.5 = e^x$

$\ln(1.5) = \ln(e^x)$

$\ln(1.5) = x$ C.P.

$[-.5, 1]$

$\frac{3}{\sqrt{e}} - \frac{1}{e} = \frac{3}{\sqrt{2.7}} - \frac{1}{2.7}$

$f(-.5) = 3e^{-.5} - e^{-1} = 1.4$

$f(\ln 1.5) = 3e^{\ln 1.5} - e^{2\ln 1.5}$

$= 3(1.5) - e^{\ln(1.5)^2}$

$= 4.5 - (1.5)^2$

$= 4.5 - 2.25$

$= 2.25$

$f(1) = 3e - e^2 < 2.25$

$= .765$