Math 180 – Fall 2012 Name: Solutions

Quiz 8

Write your answers on this page. Continue on the back if you need more space.

(5 pts) **1.** Find the absolute maximum of the following function.

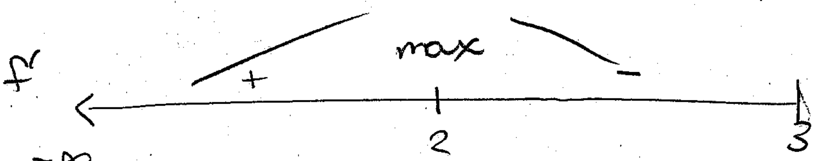
$$f(x) = x\sqrt{3-x}$$

$$f'(x) = \sqrt{3-x} + \frac{x \cdot (-1)}{2\sqrt{3-x}} = \frac{\sqrt{3-x}\cdot\sqrt{3-x}\cdot 2}{\sqrt{3-x}\; 2} - \frac{x}{\sqrt{3-x}} = \frac{2(3-x)-x}{\sqrt{3-x}}$$

$$= \frac{6-3x}{\sqrt{3-x}}$$

Set $6-3x=0$ $\Rightarrow x=2$ crit pt.

Note domain of f is $3-x \geq 0$ ie $3 \geq x$ so $x=3$ is endpt of domain.



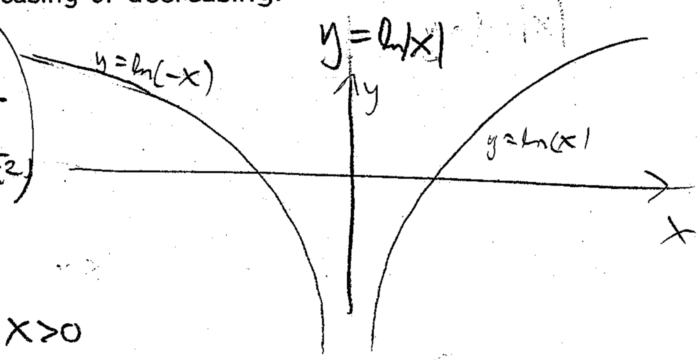
$f'(0) > 0$ $f'(2\frac{1}{2}) < 0$

$x=2$ gives the only maximum, thus the absolute maximum value of the function is $f(2) = 2\sqrt{3-2} = 2\sqrt{1} = \boxed{2}$ or $\boxed{\text{the point } (2,2)}$

(5 pts) **2.** Find the intervals on which $f(x) = \ln|x|$ is increasing or decreasing.

$$f(x) = \ln|x| = \begin{cases} \ln(x) & x>0 \\ \ln(-x) & x<0 \end{cases}$$

(Could also use $|x| = \sqrt{x^2}$ So $\ln|x| = \ln\sqrt{x^2}$)



$$f'(x) = \begin{cases} \frac{1}{x} & x>0 \\ \frac{-1}{-x}\cdot(-1) & x<0 \end{cases} = \begin{cases} \frac{1}{x} & x>0 \\ \frac{1}{x} & x<0 \end{cases} = \frac{1}{x} \text{ for all } x \neq 0$$

So $\boxed{\begin{array}{l} f'(x) > 0 \text{ and } f \text{ increasing on } x>0 \\ f'(x) < 0 \text{ and } f \text{ decreasing on } x<0 \end{array}}$

See grading note on back

(For #2)

Grading Note: I think you should have shown some justification involving one of the definitions of absolute value to show $\frac{d}{dx} \ln|x| = \frac{1}{x}$ for all $x \neq 0$.

However, if you just said $f'(x) = \frac{1}{x}$ I won't take off points on this quiz.