2/3/2012

COT 4500 Quiz #2 Solutions

1) $f(1.5) = 1.5 - 4\ln(1.5) \sim -.12186$

Since $f(1.3) > 0$, $1.3 < x < 1.5$, where x is the desired root.

$p_1 = \frac{1.3+1.5}{2} = \boxed{1.4}$

$f(1.4) = 1.4 - 4\ln(1.4) \sim .05411$, thus

$p_2 = \frac{1.4+1.5}{2} = \boxed{1.45}$

$f(1.45) = 1.45 - 4\ln(1.45) \sim -.03625$

Without this evaluation, we know $\boxed{1.4 < x < 1.5}$.

With it, we know $\boxed{1.4 < x < 1.45}$.

Either answer will be accepted.

2) $f(x) = x - 4\ln x$

Solve $x - 4\ln x = 0$

$x = 4\ln x$, note that $\frac{d}{dx} 4\ln x = \frac{4}{x}$.

on $[1.3, 1.7]$, $\frac{4}{x} > 1$.

$\frac{x}{4} = \ln x$

$e^{\frac{x}{4}} = e^{\ln x}$

$x = e^{x/4}$

$\frac{d}{dx} e^{\frac{x}{4}} = \frac{1}{4} e^{\frac{x}{4}}$.

On $[1.3, 1.7]$, $\frac{1}{4} e^{\frac{x}{4}} < 1$.

$p_0 = 1.3$

$p_1 = e^{\frac{1.3}{4}} \sim \boxed{1.384}$

$p_2 = e^{\frac{1.384}{4}} \sim \boxed{1.413}$

COT 4500 Quiz #2 Solutions

3) $f(x) = x - 4\ln(x)$, $f'(x) = 1 - \frac{4}{x}$

$$p_1 = 1.3 - \frac{f(1.3)}{f'(1.3)} \approx 1.3 - \frac{.2505}{-2.077}$$

$$\sim \boxed{1.4206}$$

$$p_2 = 1.4206 - \frac{f(1.4206)}{f'(1.4206)} \sim \boxed{1.429567995}$$

4)

$$p_2 = 1.7 - \frac{f(1.7)(1.7-1.3)}{f(1.7) - f(1.3)}$$

$$\sim \boxed{1.448898732}$$

$$p_3 = 1.45 - \frac{f(1.45)(1.45-1.7)}{f(1.45) - f(1.7)}$$

$$\sim \boxed{1.426701525}$$