Math Wiseman Midterm 1 Review Solns 10/3/01

Review exercises, pp 159-162

(17) $e^{\tan(\sin a)} \cdot (\tan(\sin a))' = e^{\tan(\sin a)} \cdot \sec^2(\sin a) \cdot \cos a$

(27) $(\ln e^{ax})' + (\ln b)' = \frac{1}{e^{ax}} \cdot (e^{ax})' + 0 = \frac{1}{e^{ax}} \cdot a e^{ax} = a$

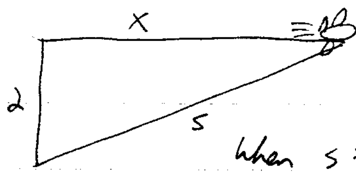
(36) $\left(\arctan \frac{2}{x}\right)' = \frac{1}{1+(\frac{2}{x})^2} \cdot \left(\frac{2}{x}\right)' = \frac{1}{1+\frac{4}{x^2}} \cdot \frac{-2}{x^2} = \frac{-2}{x^2+4}$

(78) $V = \frac{4}{3}\pi r^3$, so $V' = 4\pi r^2 r'$

The surface area $S = 4\pi r^2$, so $V' = Sr'$

We're given that $V' = \frac{1}{3} \cdot S$, so $r' = \frac{1}{3}$

(80)



$2^2 + x^2 = s^2$, so $2xx' = 2ss'$

When $s = 4.6$, $x^2 = (4.6)^2 - 2^2 = 17.16$, so $x \approx 4.14$

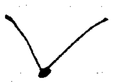
So we have $2 \cdot 4.14 \cdot x' \approx 2 \cdot 4.6 \cdot 210$, or $x' \approx 233$ mph

Check your understanding, p162

(4) $\frac{d^2}{dx^2}(\ln x^2) = \frac{d}{dx}\left(\frac{1}{x^2} \cdot 2x\right) = \frac{d}{dx}\left(\frac{2}{x}\right) = \frac{-2}{x^2}$, which is negative for $x \neq 0$, so F - concave down

(7) $(fg)'' = ((fg)')' = (f'g + g'f)' = (f''g + f'g' + g''f + g'f') = f''g + 2f'g' + g''f$, so F

(11) F -



$f'(x)$ is not defined at the corner

(12) F: $\ln x$ has positive 1st deriv $\left(\frac{1}{x}\right)$, but neg. 2nd deriv $\left(\frac{-1}{x^2}\right)$

(18) True: $f'' > 0$, $g'' > 0$, and $(f+g)'' = f'' + g'' > 0$ ∴ concave up

(19) False: $(fg)'' = f''g + 2f'g' + g''f$, which isn't nec. positive, even if f'' & $g'' > 0$.

Ex: $f(x) = x^2$, $g(x) = x^2 - 1$. Then $fg(x) = x^4 - x^2$ & $(fg)''(x) = 12x^2 - 2$.

$(fg)''(0) = -2$, so fg is concave down at 0.