2.4 Chain Rule II, Absolute Value

Page 136 #'s 55, 63, 103, 104, 119-122, 125, 126

55) $f(\theta) = (\tan(5\theta))^2$

$f'(\theta) = 2(\tan(5\theta)) \cdot \sec^2(5\theta) \cdot 5$

$\boxed{f'(\theta) = 10\tan(5\theta)\sec^2(5\theta)}$

63) $y = \sin(\tan(2x))$

$y' = \cos(\tan(2x)) \cdot \sec^2(2x) \cdot 2$

$\boxed{y' = 2\cos(\tan(2x))\sec^2(2x)}$

103) a) $h(x) = f(g(x))$

$h'(x) = f'(g(x)) \cdot g'(x)$

$h'(1) = f'(g(1)) \cdot g'(1)$

$h'(1) = f'(4) \cdot -\frac{1}{2}$

$h'(1) = 1 \cdot -\frac{1}{2}$

$\boxed{h'(1) = -1/2}$

b) $s(x) = g(f(x))$

$s'(x) = g'(f(x)) \cdot f'(x)$

$s'(5) = g'(f(5)) \cdot f'(5)$

$s'(5) = g'(6) \cdot 1$

$s'(5)$ = Does not exist b/c $g'(6)$ does not exist. $\lim_{x\to 6^-} g'(x) \neq \lim_{x\to 6^+} g'(x)$

104) a) $h'(3) = f'(g(3)) \cdot g'(3)$

$h'(3) = f'(1/2) \cdot 1/2$

$h'(3) = 1/4 \cdot 1/2$

$\boxed{h'(3) = 1/8}$

b) $s'(9) = g'(f(9)) \cdot f'(9)$

$s'(9) = g'(8) \cdot 2$

$s'(9) = -1 \cdot 2$

$\boxed{s'(9) = -2}$

119) $g(x) = |3x-5|$

$\boxed{g'(x) = \frac{3x-5}{|3x-5|} \cdot 3, \quad x \neq 5/3}$

120) $f(x) = |x^2-9|$

$\boxed{f'(x) = \frac{x^2-9}{|x^2-9|} \cdot 2x, \quad x \neq 3, \ x \neq -3}$

121) $h(x) = |x|\cos x$

$h'(x) = |x| \cdot (-\sin x) + \cos x \cdot \frac{x}{|x|} \cdot 1$

$\boxed{h'(x) = -|x|\sin x + \frac{x\cos x}{|x|}, \quad x \neq 0}$

122) $f(x) = |\sin x|$

$\boxed{f'(x) = \frac{\sin x}{|\sin x|} \cdot \cos x, \quad x \neq 0, \pi, 2\pi, \ldots}$

125) $y = (1-x)^{1/2}$

$y' = \frac{1}{2}(1-x)^{-1/2} \cdot (-1)$

$y' = \frac{-1}{2}(1-x)^{-1/2}$

False, the given y' was missing the negative from the chain rule.

126) $f(x) = (\sin(2x))^2$

$f'(x) = 2(\sin(2x)) \cdot \cos(2x) \cdot 2$

$f'(x) = 4\sin(2x)\cos(2x)$

False, the original f'(x) was missing the second application of the chain rule.