Midterm#3 Review

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19-Oct Midterm Exam #3: Sect 3.1, 3.2, 3.3, 3.4, 3.5, 3.7, 3.9

Find the x-coordinates of each point on the graph of $f(x)=x^2(4x+5)^3$ where the tangent line is horizontal.

product
power
chain

$f'(x)=0$

$f'(x) = 2x\cdot(4x+5)^3 + x^2\cdot 3\cdot(4x+5)^2\cdot 4$

$12x^2(4x+5)^2$

$= 2x(4x+5)^2\left((4x+5)+6x\right)$

$= 2x\cdot(4x+5)^2\cdot(10x+5) = 0$

$2x=0 \quad 4x+5=0 \quad 10x+5=0$

$x=0,\ x=-\frac{5}{4},\ x=-\frac{1}{2}$

Recall: $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

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77–80. Derivative formulas *Evaluate the following derivatives. Express your answers in terms of f, g, f′, and g′.*

79. $\frac{d}{dx}\left(\frac{xf(x)}{g(x)}\right)$

product rule

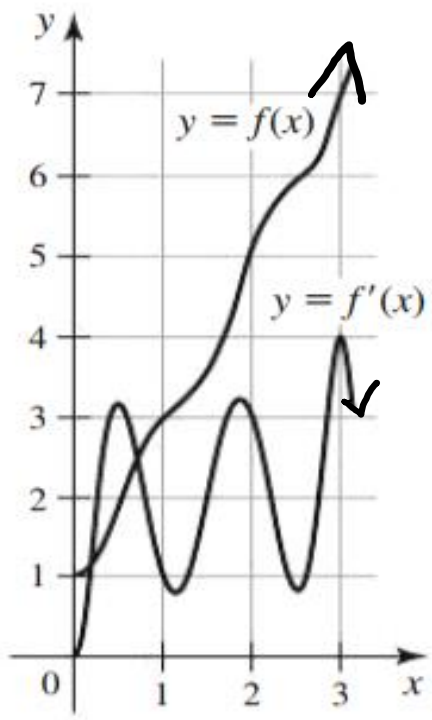
quotient rule

$$\frac{d}{dx}\left(\frac{x \cdot f(x)}{g(x)}\right) = \frac{(x \cdot f(x))' \cdot g - (x \cdot f(x)) \cdot g'}{g^2}$$

$$= \frac{[1 \cdot f(x) + x \cdot f'(x)] \cdot g - (x \cdot f(x)) \cdot g'}{g^2}$$

$$= \frac{(f + x \cdot f') \cdot g - x \cdot f \cdot g'}{g^2}$$

90–91. Derivatives from a graph *If possible, evaluate the following derivatives using the graphs of f and f'.*



90. a. $\left.\frac{d}{dx}(xf(x))\right|_{x=2}$ **b.** $\left.\frac{d}{dx}(f(x^2))\right|_{x=1}$

a) $\left.\frac{d}{dx}\left(x \cdot f(x)\right)\right|_{x=2} = \left(1 \cdot f(x) + x \cdot f'(x)\right)\Big|_{x=2}$

$= f(2) + 2 \cdot f'(2)$

$= 5 + 2 \cdot 3 = 5 + 6 = 11$

b. $\left(f'(x^2) \cdot 2x\right)\Big|_{x=1} = f'(1) \cdot 2 \cdot 1$

$= 1 \cdot 2 \cdot 1 = 2$