Key

Quiz 5
TQS 211

You are welcome to use any written homework from Chapter 3, worksheets you completed, and a calculator but no books or class notes. Show *all* your work (algebraically or geometrically) for each and simplify. No credit is given without supporting work.

1. Find the derivative of the following functions:

(a) [3] $\alpha(t) = (t^2+3)e^t$

$\alpha'(t) = [(t^2+3)e^t]'$ Product Rule (+.5)

$= (t^2+3)(e^t)' + (t^2+3)'e^t$ used correctly (+.5)

$= (t^2+3)e^t + (2t)e^t$

(+.5) (+1)

notation (+.5)

(b) [2] $\beta(x) = 5\sin(x) - 5x + 4$

$\beta'(x) = (5\sin(x) - 5x + 4)'$

$= [5\sin(x)]' - [5x]' + (4)'$

$= 5[\sin(x)]' - 5[x]' + 0$ (+.5)

$= 5\cos x - 5$

(+.5) (+.5)

constants (+.5)

(c) [4] $\gamma(p) = p\ln(2p+1)$

$\gamma(p) = p \cdot \ln(2p+1)$

Product Rule (+.5)

$\gamma'(p) = p(\ln(2p+1))' + (p')\ln(2p+1)$ (+.5) used correctly (+.5)

$= p \cdot \frac{2}{2p+1} + \ln(2p+1)$

$\ln(2p+1)$ Chain Rule (+.5)

$f(p) = \ln p \quad g(p) = 2p+1$

$f'(p) = \frac{1}{p} \quad g'(p) = 2$ (+1)

$[\ln(2p+1)]' = f'(g(p))g'(p)$

$= \frac{1}{2p+1} \cdot 2 = \frac{2}{2p+1}$ (+.5)

show steps (+.5)

$-2/3+\frac{1}{2}$ $\quad \frac{-4}{6}+\frac{3}{6}$

$-\frac{1}{3}+\frac{1}{2}=-2\cdot3$ $\quad \frac{2}{3}-\frac{1}{2}$

2. If $f(x)=\dfrac{6x^4-x^{\frac{1}{3}}}{\sqrt{x}}$, find $f'(x)$ in the following *two* ways:

(a) [3] by using the product or quotient rule

$$\frac{\sqrt{x}\left(6x^4-x^{\frac{1}{3}}\right)'-\left(6x^4-x^{\frac{1}{3}}\right)\left(\sqrt{x}\right)'}{\left(\sqrt{x}\right)^2}$$

quotient +1.5 used correctly +1.5

$$=\frac{x^{\frac{1}{2}}\left(24x^3-\frac{1}{3}x^{-\frac{2}{3}}\right)-\left(6x^4-x^{\frac{1}{3}}\right)\left(\frac{1}{2}x^{-\frac{1}{2}}\right)}{x}$$

+1.5 +1.5

$$=\frac{24x^{3.5}-\frac{1}{3}x^{-\frac{1}{6}}-3x^{3.5}+\frac{1}{2}x^{-\frac{1}{6}}}{x}$$

$$=\frac{21x^{3.5}+\frac{1}{6}x^{-\frac{1}{6}}}{x}$$

simplify +1

$$=21x^{2.5}+\frac{1}{6}x^{-\frac{7}{6}}$$ ✓

(b) [3] by using precalculus to simplify first and using the power rule

$$f(x)=\frac{6x^4-x^{\frac{1}{3}}}{x^{\frac{1}{2}}}=x^{-\frac{1}{2}}\left(6x^4-x^{\frac{1}{3}}\right)$$

+1.5 +1.5

$$=6x^{-\frac{1}{2}}x^4-x^{-\frac{1}{2}}x^{\frac{1}{3}}$$ algebra +1

$$=6x^{3.5}-x^{-\frac{1}{6}}$$

$$\Rightarrow f'(x)=6\cdot3.5x^{2.5}-\frac{1}{6}x^{-\frac{7}{6}}$$

+1.5 +1.5

$$=21x^{2.5}+\frac{1}{6}x^{-\frac{7}{6}}$$

simplify +1 ✓

(c) Simplify the above answers to make sure they are consistent with one another.

$-\frac{1}{2}+\frac{1}{3}=-\frac{3}{6}+\frac{2}{6}$

3 3.5 6 21.0

3. Let f and g have the values in the following table:

x	1	0	-2	10	12
$f(x)$	0	-2	0	-792	-1430
$g(x)$	-2	-2	10	178	262
$f'(x)$	7	3	-19	-259	-383
$g'(x)$	2	-2	10	38	46

(a) [2] Find $\left(\dfrac{f}{g}\right)'(1)$.

quotient +1.5 used formula +1.5

$$\left(\frac{f}{g}\right)'(1)=\frac{g(1)f'(1)-f(1)g'(1)}{[g(1)]^2}$$

$$=\frac{(-2)(7)-(0)(2)}{(-2)^2}$$ +1

$$=\frac{-14-0}{4}=\frac{-14}{4}=\frac{-7}{2}=-3.5$$

(b) [3] Find $(f\circ g)'(0)$.

$$(f\circ g)'(0)=f'(g(0))g'(0)$$

Chain +1.5 used formula +1.5

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

+1.5 +1.5

notation +1.5

$$=-19\cdot-2$$

+1.5

$$=38$$