NAME: SOLUTIONS

QUIZ 5

Calculus 1 for Electrotech (201-NYA-50 07)
Instructor: Emilie Richer
Date: February 19th 2010

[QUESTION 1] (17 marks)
Find the derivative of the following functions. No simplification is required.

(a) *(1 marks)* $f(x) = 2x^3 - 5x$ $\boxed{f'(x) = 6x^2 - 5}$

(b) *(2 marks)* $f(x) = \dfrac{-1}{2x} - 3\sqrt{x}$ $= -\frac{1}{2}x^{-1} - 3\sqrt{x}$ $f'(x) = \boxed{\frac{1}{2}x^{-2} - \frac{3}{2}x^{-1/2}}$

(c) *(1.5 marks)* $h(w) = e^w + \cos w - 3\sin w$

$h'(w) = \boxed{e^w - \sin w - 3\cos w}$

(d) *(2 marks)* $f(x) = (3x^4 - 12x)\ln x$ PRODUCT RULE

$f'(x) = (12x^3 - 12)\ln x + \frac{1}{x}(3x^4 - 12x)$
$= \boxed{12(x^3-1)\ln x + 3x^3 - 12}$

(e) *(2.5 marks)* $g(t) = \dfrac{1}{5t^5} - 5te^t$ $\Longrightarrow$ $g(t) = \frac{1}{5}t^{-5} - 5te^t$

$g'(t) = -t^{-6} - (5e^t + 5te^t)$
$= \boxed{-\frac{1}{t^6} - 5e^t(1+t)}$

(f) *(2 marks)* $f(x) = \dfrac{x}{\cos x}$

$f'(x) = \boxed{\dfrac{\cos x + (\sin x)x}{\cos^2 x}}$

(g) *(3 marks)* $h(z) = \dfrac{z\ln z}{-3\sin z}$ $h'(z) = \boxed{\dfrac{(\ln z + \frac{1}{z}z)(-3\sin z) - (-3\cos z)(z\ln z)}{9\sin^2 z}}$

(h) *(3 marks)* $g(t) = (\sin t)(2t^2 - t)e^t$ $\boxed{g'(t) = [\cos t\,(2t^2-t) + (4t-1)\sin t]e^t + e^t(\sin t)(2t^2-t)}$

[QUESTION 2] (5 marks)
Find the **points** (x **and** y coordinates) on the curve $f(x) = \dfrac{1}{2x+1}$

where the tangent line to the curve f(x) is parallel to the line y = –2x + 3.

(SEE QUIZ 4)

$$f'(x) = \frac{0(2x+1) - 2(1)}{(2x+1)^2} = \frac{-2}{(2x+1)^2}$$

parallel lines have the same slope
so

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

$$-2 = -2(2x+1)^2$$
$$1 = (2x+1)^2$$
$$1 = 4x^2+4x+1$$
$$0 = 4x^2+4x$$
$$0 = 4x(x+1) \qquad x=0 \quad \text{OR} \quad x=-1$$

@ $x=0$

$$y = f(0) = \frac{1}{2(0)+1} = 1$$

@ $x=-1$

$$y = f(-1) = \frac{1}{2(-1)+1} = \frac{1}{-1} = -1$$

pts: $\boxed{(0,1)}$ & $\boxed{(-1,-1)}$

NAME: SOLUTIONS

QUIZ 5B

Calculus 1 for Electrotech (201-NYA-50 07)
Instructor: Emilie Richer
Date: February 19th 2010

[QUESTION 1] (17 marks)
Find the derivative of the following functions. No simplification is required.

(a) *(1 marks)* $f(x) = 4x^5 - 7x$ $\quad f'(x) = \boxed{20x^4 - 7}$

(b) *(2 marks)* $f(x) = \dfrac{-1}{4x} - 2\sqrt{x} = -\frac{1}{4}x^{-1} - 2x^{1/2}$ $\quad f'(x) = \boxed{\frac{1}{4}x^{-2} - x^{-1/2}}$

(c) *(1.5 marks)* $h(w) = -2e^w - \cos w + 3\sin w$

$h'(w) = \boxed{-2e^w + \sin w - 3\cos w}$

(d) *(2 marks)* $f(x) = (3x^4 - 12x)\cos x$ PRODUCT RULE

$f'(x) = \boxed{(12x^3 - 12)\cos x - \sin x\,(3x^4 - 12x)}$

(e) *(2.5 marks)* $g(t) = \dfrac{1}{5t^5} - 5te^t = \frac{1}{5}t^{-5} - 5te^t$ (product Rule)

$g'(t) = \boxed{-t^{-6} - (5e^t + 5te^t)}$

(f) *(2 marks)* $f(x) = \dfrac{x}{\ln x}$ QUOTIENT RULE

$f'(x) = \dfrac{\ln x - \frac{1}{x}x}{(\ln x)^2} = \boxed{\dfrac{\ln x - 1}{(\ln x)^2}}$

(g) *(3 marks)* $h(z) = \dfrac{z\,e^z}{-3\cos z}$ QUOTIENT & PRODUCT

$h'(z) = \boxed{\dfrac{(e^z + ze^z)(-3\cos z) - (3\sin z)ze^z}{9\cos^2 z}}$

(h) *(3 marks)* $g(t) = (\sin t)(2t^2 - t)\ln t$ double PRODUCT Rule

$g'(t) = [\cos t\,(2t^2 - t) + (4t-1)\sin t]\ln t + \frac{1}{t}(\sin t)(2t^2 - t)$

$= \boxed{[(\cos t)(2t^2 - t) + (4t-1)\sin t]\ln t + (\sin t)(2t-1)}$

[QUESTION 2] (3 marks)
Find the **points** (x **and** y coordinates) on the curve $f(x) = \dfrac{1}{4x+1}$

where the tangent line to the curve f(x) is parallel to the line y = –4x + 3.

(SEE Quiz 4)

QUOTIENT RULE

$$f'(x) = \frac{-4}{(4x+1)^2}$$

Lines are parallel so they have the same slope

$$\frac{-4}{(4x+1)^2} = -4$$

$$-4 = -4(4x+1)^2$$

$$1 = (4x+1)^2$$

$$1 = 16x^2 + 8x + 1$$

$$0 = 16x^2 + 8x$$

$$= 8x(2x+1)$$

$x = 0$ OR $x = -\frac{1}{2}$

$$y = f(0) = \frac{1}{4(0)+1} = 1$$

$$y = f(-\tfrac{1}{2}) = \frac{1}{4(-\frac{1}{2})+1} = -1$$

$$\boxed{\text{Pts } (0,1) \ \& \ (-\tfrac{1}{2}, -1)}$$