NAME: _____

Math 163 (Cowen)   **Test 2 (Retake)**   **22 February 2008**

There are 5 pages and 20 questions. No partial credit! Scoring will be '100' for all correct or exactly one incorrect, '90' for 2 incorrect, '80' for 3 incorrect, etc., to '−90' for all incorrect. **You will have 1 hour to complete this test!**

For each question, find the derivative of the given function.

(10 points)   **1.** $f(x) = 3x^4 - \dfrac{x^3}{4} + 23.9x + \sqrt{2}$

$f'(x) =$

$$12x^3 - \frac{3}{4}x^2 + 23.9$$

(10 points)   **2.** $g(t) = 3\sqrt{t^9} + \dfrac{6}{\sqrt[5]{t}} - \dfrac{7}{t^6} \quad = \quad 3t^{9/2} + 6t^{-1/5} - 7t^{-6}$

$g'(t) =$

$$3\left(\frac{9}{2}\right)t^{7/2} - \frac{6}{5}t^{-6/5} + 42t^{-7}$$

(10 points)   **3.** $y = \dfrac{t^3 - 4t^4}{7 - 3t}$

$y' =$

$$\frac{(7-3t)(3t^2 - 16t^3) - (t^3 - 4t^4)(-3)}{(7-3t)^2}$$

(10 points)   **4.** $h(w) = \dfrac{2.8}{4w^5 - 3w^4 - 6w} \quad = \quad 2.8\left(4w^5 - 3w^4 - 6w\right)^{-1}$

$h'(w) =$

$$(2.8)(-1)\left(4w^5 - 3w^4 - 6w\right)^{-2}\left(20w^4 - 12w^3 - 6\right)$$

(10 points) **5.** $r(\theta) = 5\cos\theta + 3\sec\theta - 8\tan\theta$

$r'(\theta) =$

$$-5\sin\theta + 3\sec\theta\tan\theta - 8(\sec\theta)^2$$

(10 points) **6.** $f(t) = 8t^5 \cos t$

$f'(t) =$

$$40t^4\cos t + (8t^5)(-\sin t)$$

(10 points) **7.** $h(w) = \dfrac{2w^5 + \cot w}{\sin w - \cos w}$

$h'(w) =$

$$\frac{(\sin w - \cos w)\left(10w^4 - \cancel{\csc w \cot w} (\csc w)^2\right) - (2w^5 + \cot w)(\cos w + \sin w)}{(\sin w - \cos w)^2}$$

(10 points) **8.** $y = 3x^2 \sec x \tan x$

$y' =$

$$6w(\sec x\tan x) + 3x^2\left[(\sec x)(\sec x)^2 + (\tan x)(\sec x\tan x)\right]$$

(10 points) **9.** $h(\theta) = 5\cos 4\theta - 8\tan 3\theta$

$h'(\theta) =$

$$5(-\sin 4\theta)(4) - 8(\sec 3\theta)^2(3)$$

(10 points) **10.** $f(t) = \sqrt[4]{9 - 2t^3} \quad = (9 - 2t^3)^{1/4}$

$f'(t) =$

$$\frac{1}{4}(9 - 2t^3)^{-3/4}(-6t^2)$$

(10 points) **11.** $y = (x - 2x^3)^{10}$

$y' =$

$$10(x - 2x^3)^9(1 - 6x^2)$$

(10 points) **12.** $g(s) = \sqrt{s + 7\tan \pi s} \quad = (s + 7\tan \pi s)^{1/2}$

$g'(s) =$

$$\frac{1}{2}(s + 7\tan \pi s)^{-1/2}(1 + 7(\sec \pi s)^2 \pi)$$

(10 points) **13.** $F(y) = \dfrac{5}{(6 + 3y^5)^4} = 5\left(6 + 3y^5\right)^{-4}$

$F'(y) =$

$$5(-4)\left(6 + 3y^5\right)^{-5}\left(15y^4\right)$$

(10 points) **14.** $z = \cos\left(\dfrac{3}{\sqrt[4]{v}}\right) = \cos\left(3v^{-1/4}\right)$

$z' =$

$$\left[-\sin\left(3v^{-1/4}\right)\right]\left(-\tfrac{3}{4}v^{-5/4}\right)$$

(10 points) **15.** $h(u) = (5 + 8u)^3(1 - 2u)^7$

$h'(u) =$

$$3(5 + 8u)^2(8)(1 - 2u)^7 + \left(5 + 8u\right)^3\left((7)(1 - 2u)^6(-2)\right)$$

(10 points) **16.** $G(w) = 3\sec(w/5) = 3\sec\left(\tfrac{1}{5}w\right)$

$G'(w) =$

$$3\left(\sec\tfrac{1}{5}w\right)\left(\tan\tfrac{1}{5}w\right)\left(\tfrac{1}{5}\right)$$

(10 points)   **17.** $T(r) = \dfrac{4r}{\sqrt{1+r^6}}$ = $\dfrac{4r}{(1+r^6)^{1/2}}$

$T'(r) =$

$$\frac{(1+r^6)^{1/2}(4) - 4r\left(\frac{1}{2}\right)(1+r^6)^{-1/2}(6r^5)}{\left((1+r^6)^{1/2}\right)^2}$$

(10 points)   **18.** $f(z) = \sqrt{\dfrac{4-z}{4+3z}}$ = $\left(\dfrac{4-z}{4+3z}\right)^{1/2}$

$f'(z) =$

$$\frac{1}{2}\left(\frac{4-z}{4+3z}\right)^{-1/2}\left[\frac{(4+3z)(-1) - (4-z)(3)}{(4+3z)^2}\right]$$

(10 points)   **19.** $y = (5 + \cos^3 x)^4$

$y' =$

$$4\left(5+(\cos x)^3\right)^3\left(3(\cos x)^2(-\sin x)\right)$$

(10 points)   **20.** $B(t) = \sqrt{5 + \cos(1 + t^6)}$ = $\left(5 + \cos\left(1 + t^6\right)\right)^{1/2}$

$B'(t) =$

$$\frac{1}{2}\left(5 + \cos\left(1+t^6\right)\right)^{-1/2}\left(-\sin\left(1+t^6\right)\right)\left(6t^5\right)$$