NAME: Solutions

Math 23200 (Cowen) **Test 1 (Practice)** **18 January 2018**

There are 4 pages and 16 questions. No partial credit! Scoring will be '110' for all correct, '100' for one incorrect, '90' for 2 incorrect, '80' for 3 incorrect, etc., to '−50' for all incorrect.

You will have 45 minutes to complete this test!

For each of the questions 1 – 8, find the derivative of the given function.

(10 points) **1.** $f(x) = 4x^5 + 3\sqrt{x^{11}} - \dfrac{3}{\sqrt{x}} - \dfrac{4}{x^8}$

$f'(x) =$

$$4(5x^4) + 3(\frac{11}{2}x^{9/2}) - 3(-\frac{1}{2}x^{-3/2}) - 4(-8x^{-9}) = 20x^4 + \frac{33}{2}x^{9/2} + \frac{3}{2}x^{-3/2} + 32x^{-9}$$

(10 points) **2.** $g(t) = 3e^{4t}$

$g'(t) =$

$$3e^{4t}(4) = 12e^{4t}$$

(10 points) **3.** $y = 8.3 \ln 5t$

$y' =$

$$8.3\frac{1}{t}$$

(10 points) **4.** $h(w) = \dfrac{5}{\sqrt{16 - w^2}}$

$h'(w) =$

$$5\left(-\frac{1}{2}\right)(16 - w^2)^{-3/2}(-2w) = 5w(16 - w^2)^{-3/2}$$

Note: you do NOT need to simplify your answer, but you may if you wish. An error in simplification that causes your final answer to be wrong will be counted as wrong.

The underlined answers are acceptable as final answers!

(10 points) **5.** $r(\theta) = e^{\tan 5\theta}$

$r'(\theta) =$

$$e^{\tan 5\theta}(\sec 5\theta)^2(5)$$

(10 points) **6.** $f(t) = \ln(2 + e^{-3t^2})$

$f'(t) =$

$$\frac{1}{2 + e^{-3t^2}} e^{-3t^2}(-6t) = \frac{-6te^{-3t^2}}{2 + e^{-3t^2}}$$

(10 points) **7.** $h(w) = \ln\left(\frac{5w^3 + \cos w}{3 + e^{2w}}\right) = \ln\left(5w^3 + \cos w\right) - \ln\left(3 + e^{2w}\right)$

$h'(w) =$

$$\frac{1}{5w^3 + \cos w}(15w^2 - \sin w) - \frac{1}{3 + e^{2w}}(e^{2w}2)$$

(10 points) **8.** $y = (x^8 + 5)^5 e^{3x^4}$

$y' =$

$$5(x^8 + 5)^4(8x^7)e^{3x^4} + (x^8 + 5)^5 e^{3x^4}(12x^3)$$

For each of the questions 9 – 16, find an indefinite integral or the definite integral, as indicated.

(10 points) **9.** $\int (5-4z)^6\,dz =$

$$-\frac{1}{28}(5-4z)^7 + C$$

Although officially required, the +C is optional on these problems.

(10 points) **10.** $\int (2y^2+3)^5 y\,dy =$

$$\frac{1}{24}(2y^2+3)^6 + C$$

(10 points) **11.** $\int \left(3e^{2x}+1\right)^5 e^{2x}\,dx =$

$$\frac{1}{36}\left(3e^{2x}+1\right)^6 + C$$

(10 points) **12.** $\int 4\sin 5t - 2(\sec 3t)^2\,dt =$

$$-\frac{4}{5}\cos 5t - \frac{2}{3}\tan 3t + C$$

(10 points) **13.** $\int_{-1}^{1} 12a^2 + 5\,da =$

$$4a^3 + 5a\Big|_{-1}^{1} = (4 \cdot 1^3 + 5 \cdot 1) - (4 \cdot (-1)^3 + 5 \cdot (-1)) = 18$$

(10 points) **14.** $\int_{0}^{4} \sqrt{25 - 4y}\,dy =$

$$\frac{2}{3}\left(-\frac{1}{4}\right)(25 - 4y)^{3/2}\Big|_{0}^{4} = -\frac{1}{6}(9)^{3/2} + \frac{1}{6}(25)^{3/2} = \frac{125}{6} - \frac{27}{6} = \frac{49}{3}$$

(10 points) **15.** $\int_{0}^{4} \frac{12x}{144 + x^2}\,dx =$

$$6\ln(144 + x^2)\Big|_{0}^{4} = 6\ln(160) - 6\ln(144) = 6\ln(\frac{10}{9})$$

(10 points) **16.** $\int_{0}^{\pi/2} (\sin 2y)e^{\cos 2y}\,dy =$

$$-\frac{1}{2}e^{\cos 2y}\Big|_{0}^{\pi/2} = -\frac{1}{2}e^{\cos \pi} + \frac{1}{2}e^{\cos 0} = \frac{1}{2}\left(e - e^{-1}\right)$$