NAME: Solutions

Math 23200 (Cowen) **Test 1 (Practice)** **10 January 2019**

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 answers, but you may if wish. An error in simplification that results in your final answer being wrong will be counted 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.** $\int (5-4z)^6\,dz =$

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

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

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