Feedback — Chapter 2 Quiz : Differentiation

You submitted this exam on **Sat 2 Feb 2013 2:35 PM EST**. You got a score of **9.00** out of **10.00**.

The following is an *exam* and counts toward your final evaluation for this class. Please answer the ten (10) problems below. You may *not* use a calculator, or any other assistance, including software, textbooks, or notes. You may *not* collaborate with others or post your solutions on a discussion board. Use your head, some paper, and a writing utensil. Good luck!

Question 1

If $f(x) = x^{2x}$, compute $\dfrac{df}{dx}$.

Your Answer		Score	Explanation
◉ $2x^{2x}(1+\ln x)$	✓	1.00	
Total		1.00 / 1.00	

Question 2

Consider the function $f(x) = \sqrt{8}\,x^2\,e^{1-x}$. Use the formula for curvature,

$$\kappa = \frac{|f''|}{\left(1+|f'|^2\right)^{3/2}}$$

to compute the curvature of the graph of f at the point $(1, \sqrt{8})$.

Your Answer		Score	Explanation
$\frac{\sqrt{8}}{27}$	✓	1.00	
Total		1.00 / 1.00	

Question 3

Assume that x and y are related by the equation $x\cos y = \cos x - y^3$.

Compute $\frac{dy}{dx}$ evaluated at $x = 0$.

Your Answer		Score	Explanation
$-\frac{\cos(1)}{3}$	✓	1.00	
Total		1.00 / 1.00	

Question 4

Use the linear approximation of the function $f(x) = \arctan\left(e^{3x}\right)$ at $x = 0$ to estimate the value of $f(-0.01)$.

Hint: remember that $\frac{d}{dx}\arctan(x) = \frac{1}{1+x^2}$.

Your Answer		Score	Explanation
$\frac{\pi}{4} - \frac{3}{200}$	✓	1.00	
Total		1.00 / 1.00	

Question 5

A rectangular picture frame with total area $50000\ \text{cm}^2$ includes a border which is $1\ \text{cm}$ thick at the top and the bottom and $5\ \text{cm}$ thick at the left and right side. What is the largest possible area of a picture that can be displayed in this frame?

Your Answer		Score	Explanation
◉ $98\ \text{cm} \times 490\ \text{cm}$	✓	1.00	
Total		1.00 / 1.00	

Question 6

Which of the following statements are true for the function $f(x) = -\frac{4}{x} - x^4$? In order to receive full credit for this problem, you must select **all** the true statements (there may be many) and **none** of the false statements.

Your Answer		Score	Explanation
☑ The only critical point of f for $-2 \leq x \leq 2$ is at $x = 1$.	✓	0.00	
☑ The global maximum of f for $\frac{1}{2} \leq x \leq 2$ is at $x = 1$.	✓	0.33	
☐ The only critical points of f for $-2 \leq x \leq 2$ are at $x = -1$ and $x = 1$.	✓	0.00	
☑ The global minimum of f for $-2 \leq x \leq -1$ is at $x = -2$.	✓	0.33	
☐ The global maximum of f for $-1 \leq x \leq 2$ is at $x = 1$.	✓	0.00	
	✓	0.33	

☑ The global minimum of f for $-1 \leq x \leq -\frac{1}{2}$ is at $x = -1$.		
☐ The global maximum of f for $-2 \leq x \leq 2$ is at $x = 1$.	✓	0.00
☐ The global minimum of f for $-\frac{3}{2} \leq x \leq 2$ is at $x = -1$.	✓	0.00
Total		1.00 / 1.00

Question 7

To approximate $\sqrt[3]{15}$ (the cube root of 15) using Newton's method, what is the appropriate update rule for the sequence x_n?

Your Answer	Score	Explanation
◉ $x_{n+1} = x_n - \frac{3x_n^2}{x_n^3 - 15}$	✗ 0.00	
Total	0.00 / 1.00	

Question 8

Fill in the blank:

$$\ln^2(x+h) = \ln^2 x + \_\_\_\_ \cdot h + O(h^2)$$

(Here, $\ln^2 x$ means $(\ln x)^2$.)

Your Answer	Score	Explanation

$2\,\dfrac{\ln x}{x}$	✓	1.00	
Total		1.00 / 1.00	

Question 9

Recall that the kinetic energy of a body is

$$K = \frac{1}{2}\,mv^2$$

where m is mass and v is velocity. Compute the relative rate of change of kinetic energy, $\dfrac{dK}{K}$, given that the relative rate of change of mass is -7 and the relative rate of change of velocity is $+5$.

Your Answer		Score	Explanation
$\dfrac{dK}{K} = 3$	✓	1.00	
Total		1.00 / 1.00	

Question 10

Compute the eighth derivative of $(z-5)^9$ with respect to z.

Your Answer		Score	Explanation
$9!(z-5)$	✓	1.00	
Total		1.00 / 1.00	