

Name: \_\_\_\_\_ IU Username: \_\_\_\_\_

## Exam 2

In-class

- You will have **50 minutes** to complete this exam.
- This exam is printed double sided.
- This exam will be scanned. Please use only regular pencil or black ink.
- Do **NOT** detach this cover sheet from the exam.
- There is a blank page at the end of the test; it may be detached and used as scratch paper.
- During this exam, you may only use the scratch paper and writing utensils. **No calculators**, cell phones, books, notes or other resources will be permitted.
- **Multiple Choice:** No justification necessary. No partial credit. Fill in the bubble for your answer.
- **Short Answer:** No justification necessary. No partial credit. Write your answer in the box.
- **Free Response:** You must **justify your solution** to receive full credit on a problem. Any of your classmates should be able to understand how you arrived at your solution. Partial credit will be granted for work that demonstrates understanding of key concepts.
- **You can do it!**

### POINT DISTRIBUTION

Short Answer: 4 problems  $\times$  10 points each = 40 points  
Multiple Choice: 3 problems  $\times$  10 points each = 30 points  
Free Response: 3 problems  $\times$  10 points each = 30 points  
Total: 100 points

SHORT ANSWER

You do **NOT** need to justify your solutions in this section. Simply write your answer in the box. Each problem is worth ten (10) points.

**Problem 1.** Suppose the tangent line equation to the curve  $y = f(x)$  at  $(1, 4)$  is  $y = 3x + 1$ . What is  $f'(1) = ?$

**Problem 2.** Suppose a given function  $G(x)$  is differentiable at 3. How can you define  $G'(3)$ ?

**Problem 3.** Let  $f(x)$ ,  $g(x)$ , and  $h(x)$  be differentiable functions. Find the derivative of  $(f \circ g)(x) + (h(x))^2$ .

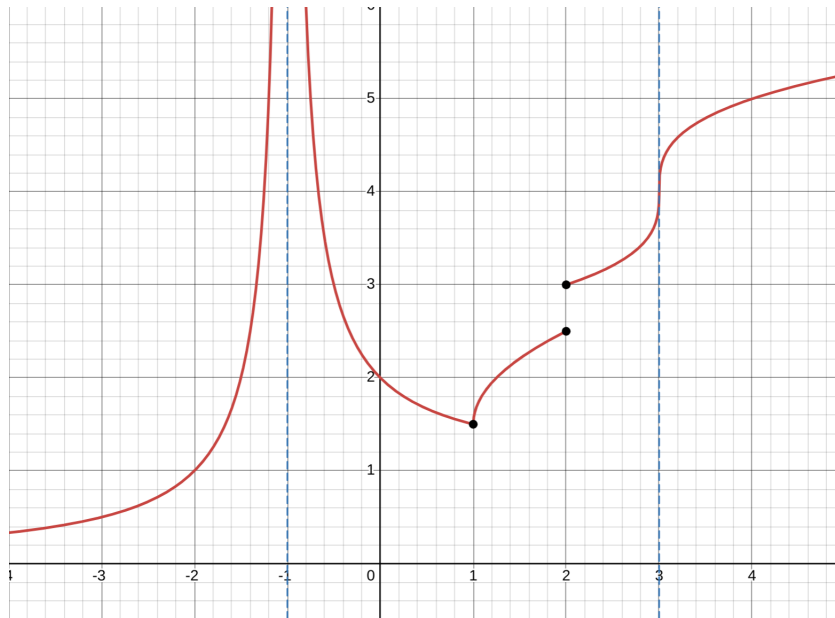
**Problem 4.** Find the limit

$$\lim_{x \rightarrow 0} \frac{\sin 5x}{\tan 7x}.$$

MULTIPLE CHOICE

You do **NOT** need to justify your solutions in this section. Simply fill in the circle that corresponds to your answer. Each problem is worth ten (10) points.

**Problem 5.** The graph of  $f(x)$  is given below. At which point,  $f$  is differentiable?



- (A) 3      (B) -1      (C) 2      (D) -2      (E) 1

**Problem 6.** Which of the following is the derivative of  $4^{\cos x}$ ?

- (A)  $\cos x \cdot 4^{\cos x - 1}$       (B)  $-4^{\cos x} \cdot \sin x$       (C)  $\ln 4 \cdot 4^{\cos x}$   
 (D)  $-\ln 4 \cdot 4^{\cos x} \cdot \sin x$       (E)  $4^{-\sin x}$

**Problem 7.** Which of the following is the derivative of  $\ln(x^3 + x)$  at  $x = 1$ ?

- (A) 4      (B) 2      (C) 0      (D) 1/2      (E) 1

FREE RESPONSE

For each of the questions in this section, you must **provide justification** for your answers.

**Problem 8.** Find the equation of the tangent line to the curve

$$y = \cos(5x) + \sin(8x)$$

at the point  $(0, 1)$ . Recall that  $\cos(0) = 1$ ,  $\sin(0) = 0$ .

**Problem 9.** The length ( $l$ ) of a rectangle *increases* by 3 ft/min while the width ( $w$ ) *decreases* by 2 ft/min. When the length is 15 ft and the width is 40 ft, what is the rate of change of the area ( $A$ )? Recall the area of rectangle is  $A = l \cdot w$ .

**Problem 10.** Find  $y'$  and  $y''$  where  $x^2 + 4y^2 = 1$  using implicit differentiation. Simplify your answers as possible as you can.

# Scratch Page

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