



*University of California, San Diego
Department of Mathematics*

Instructions

1. Write your *Name, PID, Section, and Exam Version* on the front of your Blue Book.
 2. No calculators or other electronic devices are allowed during this exam.
 3. You may use one page of notes, but no books or other assistance during this exam.
 4. Read each question carefully, and answer each question completely.
 5. Write your solutions clearly in your Blue Book.
 - (a) Carefully indicate the number and letter of each question and question part.
 - (b) Present your answers in the same order they appear in the exam.
 - (c) Start each problem on a new page.
 6. Show all of your work. No credit will be given for unsupported answers, even if correct.
 7. Turn in your exam paper with your Blue Book.
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DO NOT TURN OVER UNTIL INSTRUCTED TO DO SO

Question Zero:

0. (1 point) Carefully read and complete the instructions at the top of this exam sheet and any additional instructions written on the chalkboard during the exam.

(This exam is worth 30 points.)

1. (6 points) For each of the following, compute $\frac{dy}{dx}$:

(a) $y = \ln\left(\frac{2x+5}{x+2}\right)$

(b) $y = 10^{x^2+5x}$

(c) $\sin(5x+y) = 2x$

Note: For (c), you may leave your answer in terms of x and y .

2. (5 points) Compute the following limit:

$$\lim_{x \rightarrow 0} \frac{\tan^{-1}(2 \sin(x))}{\sin(7x)}.$$

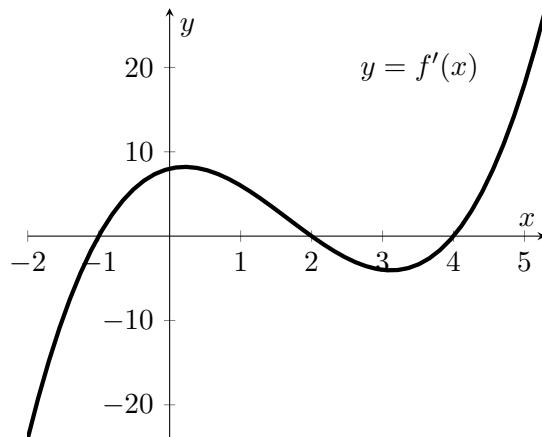
Note: \tan^{-1} denotes the inverse of the tangent function. It is also denoted arctan.

3. (6 points) Let $f(x) = \sin^2(x) - 2 \cos(x)$.

(a) List the x -coordinate of each critical point on the interval $(0, 2\pi)$ and identify each as belonging to a local maximum, local minimum, or neither of these.

(b) Find the absolute extreme values for $f(x)$ on the interval $[0, 2\pi]$.

4. (6 points) The graph below is the graph of the **derivative** of f .



List the x -coordinate of each critical point of f on the interval $(-2, 5)$ and identify each as belonging to a local maximum, local minimum, or neither of these.

5. (6 points) Compute the following:

(a) $\frac{d}{dx} (x^{2x})$

(b) $\lim_{x \rightarrow 0^+} (x^{2x})$