

Instructions

1. No calculators, tablets, phones, or other electronic devices are allowed during this exam.
 2. You may use one handwritten page of notes, but no books or other assistance during this exam.
 3. Read each question carefully and answer each question completely.
 4. Show all of your work. No credit will be given for unsupported answers, even if correct.
 5. Write your Name at the top of each page.
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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.

1. (6 points) Compute the derivative of each of the following functions.

(a) $f(x) = x^2 \arctan(x)$.

(b) $g(x) = \sqrt{4x + 5 \sin(x)}$

(c) $h(x) = \cosh(2x)$.

2. (6 points) For an invertible function $f(x)$, $f(2) = 4$, $f(4) = 2$, $f'(2) = -2$, $f'(4) = -4$.

(a) Given $g(x) = \frac{1}{f(x)}$. Find $g'(2)$.

(b) Given $h(x) = f^{-1}(x)$. Find $h'(2)$.

3. (6 points) Consider the curve defined by the equation

$$xy^3 + 2y = x^2$$

- (a) Verify that the point $(2, 1)$ is on the curve.

- (b) Find an equation for the tangent line to the curve at the point $(2, 1)$.

4. (6 points) Let $f(x) = \ln(1 + x^2)$.

(a) Find the interval(s) on which $f(x)$ is increasing.

(b) Find the interval(s) on which $f(x)$ is concave up.