

INSTRUCTIONS: Books, notes, and electronic devices are not permitted. Write (1) **your name**, (2) **1350/EXAM 2**, (3) **lecture number/instructor name** and (4) **SPRING 2014** on the front of your blue-book. Also make a **grading table** with room for 5 problems and a total score. **Start each problem on a new page.** **Box** your answers. A correct answer with incorrect or no supporting work may receive no credit, while an incorrect answer with relevant work may receive partial credit. **SHOW ALL WORK**

1. (5 points each) Find the requested derivative for each of the following:

(a) Find y' for $y = x^2 \tan x$.

(b) Find $\frac{dy}{dx}$ at $(-1, 1)$ for $(x + y)^3 = x^3 + y^3$.

(c) Find $\frac{d^2y}{dx^2}$ for $y = \sin(x^2)$.

(d) Find $f'(1)$ for $f(x) = \frac{x^2 - 4}{x - 3}$.

2. (20 points) At noon, ship A is 150 km west of ship B. Ship A is sailing east at 35 km/h and ship B is sailing north at 25 km/h. How fast is the distance between the ships changing at 4:00 PM?

3. Let $f(x) = x|x|$ and let $I = [-2, 2]$.

(a) (6 points) Can you apply the Mean Value Theorem to f on I ? Yes or No? Explain

(b) (8 points) If part (a) the MVT does apply find all c guaranteed to exist by the Mean Value Theorem on I .

Otherwise, determine an interval where the Mean Value Theorem does apply and find all c guaranteed to exist on this new interval.

(c) (6 points) [Not connected to parts (a) and (b)] Find all points of inflection of f on I .

4. Suppose that we do not have a formula for $g(x)$ but we know $g(2) = -4$ and $g'(x) = \sqrt{x^2 + 5}$ for all x

(a) (10 points) Use a linear approximation to estimate $g(1.95)$.

(b) (5 points) Is the estimate in part (a) too large or too small. Explain.

5. (5 pts each) In answering the following questions, justify each part.

Given $f(x) = \frac{x^2 - 4}{x^2 + 4}$ with $f'(x) = \frac{(x^2 + 4)2x - (x^2 - 4)2x}{(x^2 + 4)^2}$ and $f''(x) = \frac{16(4 - 3x^2)}{(x^2 + 4)^3}$,

for $f(x)$:

(a) Find the vertical and horizontal asymptotes.

(b) Find the intervals of increase or decrease.

(c) Find the local maximum and minimum values.

(d) Find the intervals of concavity and the inflection points.

(e) Use parts (a) - (d) to the sketch the graph of f . LABEL your sketch (Intercepts, asymptotes, etc.).
