Amherst College
Department of Mathematics and Statistics

MATH 105 MIDTERM 2 FALL 2018

NAME:_____

Read This First!

- Keep cell phones off and out of sight.
- Do not talk during the exam.
- You are allowed one page of notes, front and back. No other books, notes, calculators, cell phones, communication devices of any sort, webpages, or other aids are permitted.
- Please read each question carefully. Show **ALL** work clearly in the space provided. There is an extra page at the back for additional scratchwork.
- In order to receive full credit on a problem, solution methods must be complete, logical and understandable.

Grading - For Instructor Use Only

Question:	1	2	3	4	5	6	Total
Points:	8	24	8	12	8	0	60
Score:							

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1. [8 points] Consider the function

$$f(x) = 2x^3 + 5x.$$

Find an equation for the tangent line to the graph $y = f(x)$ at the point where $x = -1$.

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2. [24 points] Evaluate the derivative of each function. You **do not need to simplify** your answers.

   (a) $\dfrac{2x+1}{3x+1}$

   (b) $\dfrac{2x^2+3\sqrt{x}+5}{\sqrt{x}}$

(continued on reverse)

(c) $\sqrt{3+(1+x)^4}$

(d) $\dfrac{(2+3x)^2}{\sqrt{3-x}}$

3. [8 points] Let

$$f(x) = \sqrt{1 + x^2}.$$

Use the **limit definition** of the derivative to find $f'(x)$.

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4. [12 points] Consider the function

$$f(x) = \frac{x^2 + 1}{2x + 1}.$$

(a) Compute **and simplify** the derivative $f'(x)$.

(b) Compute **and simplify** the second derivative $f''(x)$. Your final answer should be $\dfrac{10}{(2x+1)^3}$. For full credit, show each step of your simplification.

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5. [8 points] At what points is the tangent line to the graph $y = (x+1)^2(2x-1)^3$ horizontal? For this problem, **it is enough to state the x-coordinate only** in your answer.

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6. [3 points (bonus)] Evaluate and simplify

$$\frac{d}{dx}\sqrt{1+(5+\sqrt{x/6})^{12}}.$$

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