APPM 1350 **Final Exam** **Summer 2017**

On the front of your bluebook, please write: a grading key, your name, student ID, your lecture number, and instructor. This exam is worth 100 points and has 4 questions on both sides of this paper.

- Submit this exam sheet with your bluebook. However, nothing on this exam sheet will be graded. Make sure all of your work is in your bluebook.
- **Show all work and simplify your answers!** Answers with no justification will receive no points.
- Please begin each problem on a new page.
- No notes or papers, calculators, cell phones, or electronic devices are permitted.

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1. (24 points, 8 points each) Evaluate $\dfrac{dy}{dx}$ for the following expressions

a.) $y = \int_0^{e^x} \sec^5(v)dv$

b.) $y = 3\sin^{-1}(1+2x)$

c.) $y^x = \cosh(x)$

2. (16 points, 8 points each) Evaluate the following integrals

a.) $\displaystyle\int \frac{\cos(6x)}{\sin(6x)}dx$

b.) $\displaystyle\int_0^1 x^3\sqrt{1+x^4}dx$

Problems #3,4,5 continued on back side!

3. (24 points) The following are unrelated:

a.) (8 points) Sketch the function function $f(x) = \tan(x) + \sqrt{3}$ on the interval $[-\pi, \pi]$. State and label all zeros, horizontal and vertical asymptotes, and intervals of increase/decrease on your graph.

b.) (6 points) The number of bacteria in a population is given by $y(t)$ and grows by the differential equation $dy/dt = ky$. There are initially 50 bacteria present. After 6 hours, there are 1500 bacteria. Find the value for k.

c.) (6 points) State the domain of $y = \ln(\tan^{-1}(x))$ and find $\dfrac{dy}{dx}$

d.) (4 points) **True** or **False**: an even function is always invertible on its domain. No justification is necessary.

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4. (15 points) If 300 cm^2 of material is available to make a box with a square base and an open top, find the length of the base of the box that maximizes the volume of the box. Be sure to include all units in your final answer.

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5. (21 points, 7 points each) The following are unrelated:

a.) $\lim\limits_{x \to 2^-} \tan^{-1}\left(\dfrac{4}{(x-2)^3}\right)$

b.) $\lim_{x \to 0} \dfrac{x3^x}{9^x - 1}$

c.) Use geometry to evaluate $\int_2^9 (|2x - 10| - 6)dx$.
