DEPARTMENT OF MATHEMATICS
UNIVERSITY OF KANSAS
Pretest on Calc I
MATH 122 Spring 2014

Your Name: _____

1	(5)	_____
2	(5)	_____
3	(5)	_____
4	(5)	_____
5	(5)	_____
6	(5)	_____
Total	(30)	_____

(1) Which integral matches the Riemann sum?

$$\lim_{n\to\infty}\sum_{i=1}^{n}\frac{1}{n}\left(\frac{2n+i}{n}\right)^2$$

(a) $\int_0^1 x\,dx$ (b) $\int_2^3(2x+1)^2\,dx$ (c) $\int_0^1 \frac{dx}{x^3}$ (d) $\int_0^1(2+x)^2\,dx$

(2) If f, f' and f'' are continuous functions on the interval [a,b], such that $f'(a) > 0, f'(b) < 0$, and $f''(x) < 0$ for all x in (a,b), then which of the following must be true:

(a) There exist a number c, in (a,b), such that $f(c) = 0$.
(b) There exist a number c in (a,b) such that $f(c) = \frac{a+b}{2}$.
(c) $f(x)$ has a local minimum in the interval (a,b).
(d) $f(x)$ has a local maximum in the interval (a,b).
(e) None of the above.

(3) A rectangular box with a square base and open top is constructed to have volume of 625 cubic inches. The material used to make the bottom costs 4 cents per square inch and the material used to make the sides costs 2 cents per square inch. Find the dimensions of the box that minimizes the total costs. Justify your answer.

(4) Compute the limit

$$\lim_{x \to 1+} \left(\frac{x}{x-1} - \frac{1}{\ln(x)} \right)$$

(5) For the implicitly defined curve

$$x^y = y^x,$$

write the equation of the tangent line at the point $P(2, 2)$.

(6) Evaluate the improper integral or otherwise show it is divergent

$$\int_0^\infty x^2 e^{-x} dx.$$