Calculus II
Exam 1

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Answer all of the following questions. Additional sheets are available if necessary. No books or notes may be used. You may use a calculator. You may not use a calculator which has symbolic manipulation capabilities. When answering these questions, please be sure to 1) check answers when possible, 2) clearly indicate your answer and the reasoning used to arrive at that answer *(unsupported answers may not receive credit).*
Each question is followed by space to write your answer. Please lay out your solutions neatly in the space below the question. You are not expected to write each solution next to the statement of the question.

Name _____

Section _____

Question	Score	Total
1		10
2		12
3		16
4		16
5		8
6		10
7		10
8		10
9		12
Min(Total,100)		104

1. Let $f(x) = -\sqrt{x-3}$.

   (a) Find $f^{-1}(x)$.

   (b) Give the domain and range of f.

   (c) Give the domain and range of f^{-1}.

2. (a) State the definition of $\ln x$.

   (b) Find the tangent line to $y = 1/x$ which is tangent at $x = 3$.

   (c) Find the area bounded by $x = 1$, $x = 3$, $y = 0$ and the tangent line you found in part a).

   (d) Use your answer to b) to find a number a with $a \leq \ln 3$.

3. Compute the following derivatives.

(a) $\dfrac{d}{dx}(\ln x^2 - 2\ln x)$.

(b) $\dfrac{d}{dx}\tan^{-1}(x^2 - x)$.

(c) $\dfrac{d^3}{dx^3}\ln(1+x)$

(d) $\dfrac{d}{dt}(t^e - e^t)$

4. Compute the following integrals.

(a) $\displaystyle\int_0^{1/2} \frac{1}{\sqrt{1-x^2}}\,dx$

(b) $\displaystyle\int \frac{1+x}{4+x^2}\,dx$

(c) $\displaystyle\int_0^1 xe^{x^2}\,dx$

(d) $\displaystyle\int \frac{(\ln x)^2}{x}\,dx$

5. If $y(x)$ solves the equation $y' + 2xy = 0$ on an interval, show that $y(x) = Ae^{-x^2}$. Hint: Differentiate $y(x)/e^{-x^2}$.

6. The isotope Kryptonite 210 has a half-life of 140 days.

   (a) If a sample of Kryptonite 210 has a mass of 100 grams, find the mass that remains after t days.

   (b) Find the mass that remains after 10 days.

   (c) When will the mass be 15 grams?

7. (a) If $\cos(u) = -5/13$ and $\pi < u < 2\pi$, find $\sin u$, $\tan u$ and $\sin(2u)$.

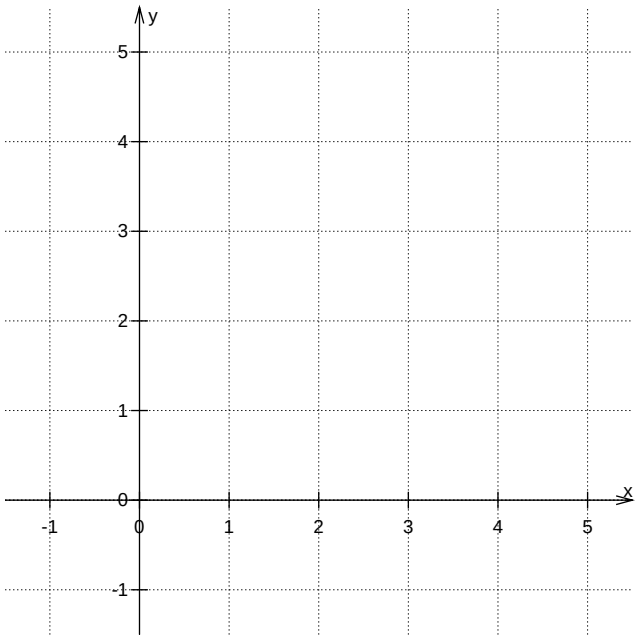
   (b) Find $\cos(\sin^{-1}(1/2))$.

   (c) Find $\sin^{-1}(\sin(5\pi/4))$.

8. Let $f(x) = \sin x$ for x in the interval, $\pi/2 \leq x \leq 3\pi/2$.

   (a) Sketch the graphs of f and f^{-1}.

   (b) Find $f^{-1}{}'$. Simplify your answer.



9. Compute the following limits.

(a) $\lim_{x \to 0} xe^{-x}$

(b) $\lim_{x \to \infty} xe^{-x}$

(c) $\lim_{x \to 0} \dfrac{\cos(x^2) - 1}{x}$

(d) $\lim_{x \to 0} \dfrac{e^x - 1 - x}{x^2}$