UNIVERSITY OF CALIFORNIA, DAVIS
FINAL EXAMINATION
SHORT CALCULUS- 16B

Date: 12/11/2013
Total Marks: 50
Time: 2 Hours

Name: **ID:**

INSTRUCTIONS

(1) **Write your name and ID in the indicated space above.**
(2) **Answer ANY FIVE questions.**
(3) **The numbers at the top of each question indicate the distribution of points for all parts of the question. All questions carry** 10 **points.**
(4) You must **show your work/calculation** wherever it is necessary to obtain the answer.
(5) **Write answers only in the space provided.** If necessary use separate sheets for rough work. If extra sheets are needed please staple them with the main answer sheet before submitting.
(6) State your answers clearly. For example you can draw a box around your answer after you finish computations.
(7) **Use of *all* electronic gadgets, e.g. mobiles, pagers, smart phones, calculators are prohibited during the exam.**
(8) Discussion among students during the exam is prohibited.
(9) **Use of textbooks, or class notes are strictly prohibited.** This is a closed-book exam. Any student trying to use unfair means at any time of the exam may be asked to leave the exam hall and she/he may get a zero score for the exam in such a case.
(10) **Put down your signature at the bottom of this page.**

Student's Signature:

Question A. $(5+5)$

(1) Find the indefinite integral $\int (x+1)\ln x\,dx$**.**

(2) Compute $\int_0^{\pi/2} \sin x \cos^2 x\,dx$**.**

Question B. $(5+5)$

(1) Find the indefinite integral $\int xe^{2x}\,dx$**.**

(2) Compute $\int_0^3 \frac{x}{\sqrt{x+1}}\,dx$**.**

Question C. $(4+3+3)$

(1) Obtain the partial fraction decomposition of $\frac{x+3}{x(x^2-1)}$**.**

(2) Find the indefinite integral $\int \frac{x+3}{x(x^2-1)}\,dx$**.**

(3) Does the improper integral $\int_1^2 \frac{x+3}{x(x^2-1)}\,dx$ **converge?**

Question D. $(4+6)$

(1) Find the indefinite integral $\int xe^{-x^2}\,dx$.

(2) Determine if the improper integral $\int_{-\infty}^{\infty} xe^{-x^2}\,dx$ converges. If it converges determine its value.

Question E. $(5+5)$

(1) Find the area of the region bounded by the curves $y = x^2 - 1$ and $y = 1 - x$.

(2) Let R be the region bounded by the curve $y = x^2$ and the line $y = 1$. Compute the volume of the solid obtained by revolving R about the x-axis.

Question F. $(4+3+3)$

Suppose a continuous random variable has probability density function $f(x) = \frac{3}{4}(1-x^2)$, $-1 \leq x \leq 1$.

(1) Compute $P(0 < X \leq 1)$.

(2) Compute the mean $E(X)$.

(3) Compute the variance $V(X)$.

Question G. $(6+4)$
Determine if the following improper integrals converge.
(1) $\int_0^\infty \frac{1}{1+5e^x}\,dx$**.**
(2) $\int_0^\infty \sin x\,dx$**.**
Show your work.