This is a closed book exam. No books or notes are to be used during the exam. You may use a graphing calculator if it does not have symbolic manipulation capabilities. However, any device capable of electronic communication (cell phone, pager, etc.) must be turned off and out of sight during the exam.

Each question is followed by space to write your answer. Please write your solutions neatly in the space below the question. *Show your work*. Answers without justification will receive no credit. Partial credit for a problem will be given only when there is coherent written evidence that you have solved part of the problem. In particular, answers that are obtained simply as the output of calculator routines will receive no credit.

Name: ⸻⸻⸻⸻⸻⸻

Section: ⸻⸻

Last four digits of student identification number: ⸻⸻⸻

Page	Score	Total
1		24
2		24
3		22
4		20
5		20
Total		110

Useful formulas

$$\frac{d}{dx}\tan x = \sec^2 x$$

$$\frac{d}{dx}\sec x = \sec x \tan x$$

$$\frac{d}{dx}\sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\tan^{-1} x = \frac{1}{1+x^2}$$

$$\frac{d}{dx}\ln|\sec x + \tan x| = \sec x$$

1) (15 pts) Compute each of the integrals below and simplify your answer.

(a) (8 pts) $\int_0^{\pi/2} \sin(2x)\, dx$

(b) (8 pts) $\int xe^{3x}\, dx$

(c) (8 pts) $\int_0^{1/2} \sin^{-1}(x)\, dx$

1

(d) (8 pts) $\int \dfrac{x+1}{4+x^2}\,dx$

(e) (8 pts) $\displaystyle\int_1^e \dfrac{(\ln x)^2}{x}\,dx$

(f) (8 pts) $\int \dfrac{e^x\,dx}{1+e^{2x}}$

(g) (8 pts) $\int \tan^3 \theta \sec \theta \, d\theta$

(h) (14 pts) $\int \dfrac{x^2}{\sqrt{1-x^2}} \, dx$

2) Let R be the region bounded by the curves $y = x^4$, $x = 2$ and $y = 0$.

(a) Use the method of washers to find the volume of the solid obtained when the region R is rotated around the y-axis. Begin by drawing a picture of this solid and obtaining the dimensions of a typical slice.

(b) Use the method of cylindrical shells to find the volume of the solid obtained when the region R is rotated around the y-axis. Begin by drawing a picture of a typical cylindrical shell and obtaining its dimensions.

3) (10 pts) Use a known Maclaurin series to find the Maclaurin series for $f(x) = xe^{-x}$ and specify the values of x for which this series converges.

4) (10 pts) Find the Taylor series for $f(x) = \frac{1}{x}$ centered at 2, i.e., a $= 2$, and specify the values of x for which this series converges.