

November 13, 1998

Name (PRINT) _____ (1) *Return* this exam copy with your exam booklet. (2) *Write* your solutions in your exam booklet. (3) *Show* your work. (4) There are *six* questions on this exam. (5) *You are expected to abide by the University's rules concerning academic honesty.*

1. (18) Find the *volume* of the solid generated by rotating the region in the plane determined by $y = 3x$ and $y = x^2$ about the line $y = -2$.
2. (18) The density function of a rod of length 2 units is given by $\rho(x) = x^2 - x + 1$.
 - a) Find the *mass* of the rod.
 - b) Find the *center of mass* of the rod.
3. (18) A 13 foot tall cylindrical tank with circular base of radius 5 feet contains 6 feet of water. Find the *amount of work* required to lift the water out of the top of the tank.
4. (18) Find the *future value* 11 years from now of a constant income stream of \$3,000 per year. The income stream begins 2 years from now is invested at 7% per year compounded continuously.
5. (18) The age density function of a very resilient insect population is given by

$$\rho(x) = \begin{cases} 0 & : x < 0 \\ C(1+x)^{-5} & : 0 \leq x \end{cases}$$

for some constant C .

- a) Find C .
 - b) Find the *cumulative distribution function*.
 - c) What *fraction* of the insect population lives 3 or more years?
6. (10) Let $f(x) = e^{2(x-1)} + 3x + 4x^2$. Find the Taylor polynomial of degree 2 approximating $f(x)$ at x near 1.