

Practice Final
MAT-16B Short Calculus - II
Spring 2011

Name _____

- This test is closed notes, closed book.
- Calculators **ARE** allowed in this final.
- There are 6 pages and 10 questions total.
- For numerical answers, compute the final value using your calculator. **DO NOT** leave it as a long expression like :
 $((250 - 63)/(1 - e^{(-6*3.5)})) * \ln(27/168)$. **Show your work clearly !!**
- The maximum score in the test is 150 points.

Signature _____

Problem	Score	Max Possible
1		55
2		10
3		7
4		8
5		10
6		10
7		20
8		10
9		10
10		10
Total		150

1. Compute the following integrals (note that some of them are indefinite integrals and some are definite integrals).

(a) **(6 pts)** $\int \frac{e^{7x}}{50+e^{7x}} dx.$

(b) **(7 pts)** $\int x\sqrt{5-x} dx.$

(c) **(7 pts)** $\int x \ln(x+1) dx.$

(d) **(7 pts)** $\int (\cos(x) + \sec(x))^2 dx.$

(e) (7 pts) $\int \tan^3(x) dx$.

(f) (7 pts) $\int (\ln(x))^2 dx$.

(g) (7 pts) $\int \frac{1+x}{x+3e^{-x}} dx$.

(h) (7 pts) $\int_0^{\infty} \frac{x^2}{e^{x^3}} dx$

2. **(10 pts)** Consider the region bounded by the curves $y = 3x^3 - x^2 - 10x$ and $y = -x^2 + 2x$. Set up (but DO NOT EVALUATE) the integral(s) to compute the area of this region.
3. **(7 pts)** Find $y' = \frac{dy}{dx}$ for $e^{xy} = y^3 + x^2 + \ln(y)$.
4. **(8 pts)** Consider the region bounded by the graphs $y = \sqrt{2x}$, $y = \frac{x}{2}$, $x = 0$ and $x = 1$. Set up (but DO NOT EVALUATE) the integral to compute the volume of the solid obtained by revolving this region around the x -axis.
5. **(10 pts)** Use the Trapezoidal rule with $n = 4$ to estimate the value of the following integral.

$$\int_{-1}^1 \log_{10}(3 + 2x) dx$$

6. **(10 pts)** The number of wild hogs in a game preserve after t years is given by

$$N(t) = 500 - \frac{400}{1 + 2t}$$

for $t \geq 0$. What is the average number of wild hogs from $t = 0$ years to $t = 2$ years ?

7. Let $f(x) = \frac{1}{4\sqrt{x}}$, $1 \leq x \leq 9$ be the probability density function for a continuous random variable measuring the number of hours in a week that Davis commuters spend driving their automobiles.
- (a) **(5 pts)** Verify that $f(x)$ is a probability density function.
- (b) **(3 pts)** Compute the probability that x takes values greater than or equal to 6.
- (c) **(6 pts)** Compute the expected value $E[x]$.
- (d) **(6 pts)** Compute the median for this random variable.
8. **(10 pts)** Assume that while chewing Bubble gum, the amount of sugar in the gum decreases following an exponential decay model. If after 1 minute of chewing, 75% of the original amount of sugar is left, what percent of the original amount of sugar will remain after 10 minutes ?
9. **(10 pts)** Suppose that the area bounded under the curve $y = 10e^x$ and $y = 0$ and between $x = 0$ and $x = b$ is equal to 10. What is the value of b ?

10. **(10pts)** We are given a probability density function $f(x) = kx^8$ for a continuous random variable with the range of values $0 \leq x \leq b$. It is known that the median for this random variable is 1. What is the value of k and b ?