Exam II Practice

Instructions: No notes or calculators are allowed. Answers must be supported by work on your exam sheets. Answers with little or no supporting work will receive little or no credit. **Work must be neat, organized and easily interpreted.**

Please circle your final answers.

$$\sin mx \sin nx = \frac{1}{2}\left[\cos\big((m-n)x\big) - \cos\big((m+n)x\big)\right]$$
$$\sin mx \cos nx = \frac{1}{2}\left[\sin\big((m-n)x\big) + \sin\big((m+n)x\big)\right]$$
$$\cos mx \cos nx = \frac{1}{2}\left[\cos\big((m-n)x\big) + \cos\big((m+n)x\big)\right]$$

Practice 1

1. Evaluate the integrals.

    a. $\int xe^{3x}\,dx$
    b. $\int_0^{\pi/2} \cos^3(2x)\sin^2(2x)\,dx$
    c. $\int_0^{\sqrt{2}/4} \frac{2}{\sqrt{1-4x^2}}\,dx$
    d. $\int \frac{3}{\sqrt{1+9x^2}}\,dx$

2. Set up an integral for the volume of the solid. DO NOT SOLVE THE INTEGRALS.
    a. The solid generated by revolving the region bounded by the curves $y = \sqrt{9-x^2}$ and $y = 0$ about the x-axis.
    b. The solid generated by revolving the region bounded by the curves $y = 2x - 1$, $y = \sqrt{x}$, and $x = 0$ about the y-axis.
3. Set up an integral for the length of the curve $y = \ln(x) - \frac{x^2}{8}$ from $x = 1$ to $x = 2$. DO NOT SOLVE THE INTEGRAL.
4. Set up an integral for the area of the surface generated by revolving $y = \sqrt{x+4}$, $1 \le x \le 5$, about the x-axis. DO NOT SOLVE THE INTEGRAL.
5. Express the integrand as a sum of partial fractions. DO NOT DETERMINE THE COEFFICIENTS NOR EVALUATE THE INTEGRAL.
$$\int \frac{(x-6)^2}{x^2(x-1)^3(x^2+2x+2)}\,dx$$
6. Re-write the following improper integral as the sum of limits of proper integrals. DO NOT SOLVE THE INTEGRAL.
$$\int_2^{\infty} \frac{1}{x\sqrt{x^2-4}}\,dx$$

BONUS PROBLEM: Estimate $\int_0^2 3x\,dx$.

a. By using the Trapezoid Rule with $n = 4$ steps.
b. By using Simpson's Rule with $n = 4$ steps.

Practice 2

1. Set up an integral for the volume of the solid generated by revolving the region bounded by the curves $2y = x + 4, y = x$ and $x = 0$ about:
   a. the x-axis. DO NOT SOLVE THE INTEGRAL.
   b. the y-axis. DO NOT SOLVE THE INTEGRAL.
2. Set up an integral for the length of the curve $y = \sin x - x\cos x$ from $x = 0$ to $x = \pi$. DO NOT SOLVE THE INTEGRAL.
3. Set up an integral for the area of the surface generated by revolving $y = \sqrt{2x - x^2}, \frac{1}{2} \leq x \leq \frac{3}{2}$, about the x-axis. DO NOT SOLVE THE INTEGRAL.
4. Express the integrand as a sum of partial fractions. DO NOT DETERMINE THE COEFFICIENTS NOR EVALUATE THE INTEGRAL.
$$\int \frac{(x+5)^2}{x(x-100)^3(x^2+2x+12)^2}\,dx$$
5. Evaluate the integrals.
   a. $\int \theta \cos(2\theta + 1)\,d\theta$
   b. $\int \cos^5(2x)\sin^5(2x)\,dx$
   c. $\int \sin 5\theta \cos 6\theta\,d\theta$
   d. $\int \frac{\sqrt{1-v^2}}{v^2}\,dv$
   e. $\int \frac{1}{x^2+8x+17}\,dx$
   f. $\int_0^1 \frac{1}{(y-1)^{2/3}}\,dy$

BONUS PROBLEM: Evaluate: $\int \frac{x}{1+\sqrt{x}}\,dx$

Practice 3

1. Set up an integral for the volume of the solid generated by revolving the region bounded by the curves $2y = -5x + 10, y = -x + 2$ and $x = 0$ about:
   a. the x-axis. DO NOT SOLVE THE INTEGRAL.
   b. the y-axis. DO NOT SOLVE THE INTEGRAL.
2. Set up an integral for the length of the curve $y = \sqrt{2x - x^2}, \frac{1}{2} \leq x \leq \frac{3}{2}$. DO NOT SOLVE THE INTEGRAL.
3. Set up an integral for the area of the surface generated by revolving $y = \sin x - x\cos x$ from $x = 0$ to $x = \pi$, about the x-axis. DO NOT SOLVE THE INTEGRAL.
4. Express the integrand as a sum of partial fractions. DO NOT DETERMINE THE COEFFICIENTS NOR EVALUATE THE INTEGRAL.
$$\int \frac{(x-9)^8}{x(x-100)^2(x^2+2x+12)^3}\,dx$$
5. Evaluate the integrals.
   a. $\int x^2 \ln x\,dx$
   b. $\int \cos^5(2x)\sin^3(2x)\,dx$
   c. $\int \sin 3\theta \cos 4\theta\,d\theta$
   d. $\int \frac{\sqrt{v^2-49}}{v}\,dv,\ v > 7$
   e. $\int \frac{1}{x^2+2x+2}\,dx$
   f. $\int_0^2 \frac{1}{(y-1)^4}\,dy$

BONUS PROBLEM: Evaluate: $\int \frac{1}{v(1-v^{1/4})}\,dv$