MATH 206 - Dr. Bogacki

SAMPLE FINAL

Summer 2001

1. Find $\frac{dy}{dx}$ if

(a) $y = \int_x^2 e^{t^2} dt$ (b) $y = \int_0^{x^2} \sin(t^4)\, dt$

2. Evaluate:

(a) $\int \sec^4 x \tan^4 x\, dx$ (b) $\int e^x \sin x\, dx$ (c) $\int \frac{x^3}{x^2 - 3x + 2} dx$

3. Evaluate

(a) $\int \frac{5x^3 + 5x^2 - 5x}{3x^4 + 4x^3 - 6x^2} dx$ (b) $\int x^2 \cos x dx$ (c) $\int \frac{dx}{x\sqrt{3 - x^2}}$

4. Evaluate

(a) $\int \frac{x^2 + 2x}{\sqrt{x+2}} dx$ (b) $\int \frac{dx}{x^4\sqrt{x^2 - 9}}$ (c) $\int \frac{x^2 + 3x + 2}{x^3 + x} dx$

5. Evaluate:

(a) $\int_1^2 \ln x\, dx$ (b) $\int_1^4 \frac{1}{(x-2)^2} dx$ (c) $\int_0^\infty \frac{5x}{(x^2+1)^2} dx$

6. Consider the region bounded by the graphs of $y = \sqrt{x}$ and $y = x^3$.

(a) Find the area of the region.

(b) Set up the integral corresponding to the the volume of the solid generated by revolving the region about the x-axis.

(b) Set up the integral corresponding to the the volume of the solid generated by revolving the region about the y-axis.

(b) Set up the integral corresponding to the the volume of the solid generated by revolving the region about the line $y = 2$.

7. Given the curve $y = \cot x$, $\frac{\pi}{4} \le x \le \frac{\pi}{2}$, set up the integrals (without evaluating) corresponding to

(a) the arc length of the curve,

(b) area of the surface obtained by rotating the curve about the x-axis,

(c) area of the surface obtained by rotating the curve about the y-axis,

(d) area of the surface obtained by rotating the curve about the line $x = \pi$,

(e) area of the surface obtained by rotating the curve about the line $y = 1$.

8. Consider $f(x,y,z) = \frac{xe^y}{z}$

(a) find all first partial derivatives of f,

(b) verify that $f_{xz} = f_{zx}$

9. Solve:

(a) $y^3 y' = (y^4 + 1)\cos x$

(b) $xy' - y = x$, $x > 0$

(c) $y' + 2xy = x$, $y(0) = -2$

10. Solve:

(a) $y'' + 2y' - 8y = 0$, $y(0) = 5$, $y'(0) = -2$

(b) $y'' - 2y' + y = 0$, $y(0) = -1$, $y(1) = 2e$

(c) $y'' - 4y' + 5y = 0$, $y(0) = 2$, $y(\pi/2) = e^\pi$