Calculus II for the Life, Social and Managerial Sciences

Math 128 — Fall 2007

In-term exam October 24

Name: **Student-ID:**

This exam contains sixteen problems. Problems 1 – 14 are multiple choice problems, which each count 5% towards your total score. Problem 15 and 16 will be hand-graded (with a possibility of partial credit) and count 15% each towards your total score.

Problem 1

Solve the equation $\cos t = \sin t$ for $0 \leq t \leq \frac{3\pi}{2}$.

A) $t = \frac{\pi}{4}$

B) $t = \frac{3\pi}{4}$

C) $t = \frac{5\pi}{4}$

D) $t = \frac{7\pi}{4}$

E) $t = \frac{\pi}{4}$ or $t = \frac{5\pi}{4}$

F) $t = \frac{3\pi}{4}$ or $t = \frac{7\pi}{4}$

G) $t = \frac{\pi}{4}$ or $t = \frac{3\pi}{4}$

H) $t = \frac{3\pi}{4}$ or $t = \frac{5\pi}{4}$

Problem 2

Compute

$$\int_0^{\pi/17} 5\sin(17x-\pi)\,dx$$

A) $-\frac{10}{17}$

B) $-\frac{5}{17}$

C) $\frac{5}{17}$

D) $\frac{10}{17}$

E) $-\frac{10}{\pi}$

F) $-\frac{5}{\pi}$

G) $\frac{5}{\pi}$

H) $\frac{10}{\pi}$

Problem 3

Let $f(x) = \tan(\sqrt{x-1})$. Calculate $f'(x)$.

A) $\frac{1}{\cos^2(\sqrt{x-1})}$

B) $\frac{2\sqrt{x-1}}{\cos^2(\sqrt{x-1})}$

C) $\tan(\frac{1}{2\sqrt{x-1}})$

D) $\frac{1}{2\sqrt{x-1}\tan^2(\sqrt{x-1})}$

E) $\frac{1}{\sqrt{x-1}\cos^2(\sqrt{x-1})}$

F) $\frac{\sqrt{x-1}}{\cos^2(\sqrt{x-1})}$

G) $\frac{\sqrt{x-1}}{\tan^2(\sqrt{x-1})}$

H) $\frac{1}{2\sqrt{x-1}\cos^2(\sqrt{x-1})}$

Problem 4

Evaluate the definite integral

$$\int_{\frac{\pi}{3}}^{\frac{5\pi}{12}} \frac{1}{\cos^2(3x)}\,dx$$

A) $-\frac{1}{3}\sqrt{3}$

B) $-\frac{1}{3}$

C) $-\frac{1}{9}\sqrt{3}$

D) 0

E) $\frac{1}{9}\sqrt{3}$

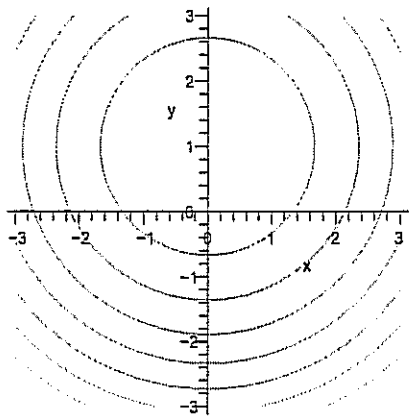
F) $\frac{1}{3}$

G) $\frac{1}{3}\sqrt{3}$

H) 1

Problem 5

Which function $f(x, y)$ do these level curves belong to?



A) $f(x, y) = x^2 + (y + 1)^2$

B) $f(x, y) = (x - 1)^2 + y^2$

C) $f(x, y) = (x + 1)^2 + y^2$

D) $f(x, y) = (x - 1)^2 + (y - 1)^2$

E) $f(x, y) = (x + 1)^2 + (y - 1)^2$

F) $f(x, y) = (x - 1)^2 + 2y^2$

G) $f(x, y) = x^2 + (y - 1)^2$

H) $f(x, y) = x^2 + 2(y - 1)^2$

Problem 6

Compute the indefinite integral

$$\int \frac{e^x}{(1+e^x)^2}\,dx$$

A) $\frac{1}{2}\cdot\frac{1}{1+e^x}+C$

B) $-\frac{1}{2}\cdot\frac{1}{1+e^x}+C$

C) $\frac{1}{1+e^x}+C$

D) $-\frac{1}{1+e^x}+C$

E) $\frac{1}{2}\cdot\frac{e^x}{1+e^x}+C$

F) $-\frac{1}{2}\cdot\frac{e^x}{1+e^x}+C$

G) $\frac{1}{(1+e^x)^2}+C$

H) $-\frac{1}{(1+e^x)^2}+C$

Problem 7

Evaluate

$$\int x\sqrt{2-x}\,dx$$

A) $\frac{2}{3}x(2-x)\sqrt{2-x} - \frac{2}{3}(2-x)\sqrt{2-x} + C$

B) $-\frac{2}{3}x(2-x)\sqrt{2-x} + \frac{2}{3}(2-x)\sqrt{2-x} + C$

C) $\frac{2}{3}x(2-x)\sqrt{2-x} - \frac{5}{3}(2-x)\sqrt{2-x} + C$

D) $-\frac{2}{3}x(2-x)\sqrt{2-x} + \frac{5}{3}(2-x)\sqrt{2-x} + C$

E) $\frac{2}{3}x(2-x)\sqrt{2-x} + \frac{4}{15}(2-x)^2\sqrt{2-x} + C$

F) $-\frac{2}{3}x(2-x)\sqrt{2-x} + \frac{4}{15}(2-x)^2\sqrt{2-x} + C$

G) $-\frac{2}{3}x(2-x)\sqrt{2-x} - \frac{4}{15}(2-x)^2\sqrt{2-x} + C$

H) $\frac{2}{3}x(2-x)\sqrt{2-x} - \frac{4}{15}(2-x)^2\sqrt{2-x} + C$

Problem 8

Find the area under the curve $y = x^2e^x$ from $x = 0$ to $x = 2$.

A) $2e^2 - 2$

B) $2e^2 + 2$

C) $2e^2 - 4$

D) $2e^2 + 4$

E) $4e^2 + 4$

F) $4e^2 - 4$

G) $4e^2 + 2$

H) $4e^2 - 2$

Problem 9

Determine the average value of $f(x) = \frac{1}{x}(\ln x)^2$ over the interval from $x = 1$ to $x = 3$.

A) $\frac{1}{6}(\ln 2)^3$

B) $\frac{1}{6}(\ln 3)^3$

C) $\frac{1}{4}(\ln 2)^2$

D) $\frac{1}{3}(\ln 3)^3$

E) $\frac{1}{2}(\ln 2)^2$

F) $\frac{1}{2}(\ln 3)^3$

G) $(\ln 2)^2$

H) $(\ln 3)^3$

Problem 10

Use the Midpoint Rule with $n = 4$ to approximate $\int_1^5 \frac{1}{\ln(x+0.5)}\,dx$ to 4 decimal places.

A) 3.6710

B) 3.6833

C) 3.6956

D) 3.7079

E) 3.7202

F) 3.7325

G) 3.7448

H) 3.7571

Problem 11

Use the Trapezoidal Rule with $n = 4$ to approximate $\int_1^5 \frac{1}{\ln(x+0.5)}\,dx$ to 4 decimal places.

A) 4.0563

B) 4.0686

C) 4.0809

D) 4.0932

E) 4.1055

F) 4.1178

G) 4.1301

H) 4.1424

Problem 12

Let $f(x,y) = (\sin x + \cos y)^2$. Compute the partial derivatives of f with respect to x and y. Then:

$$\frac{\partial f}{\partial x} + \frac{\partial f}{\partial y} = \cdots$$

A) $2(\sin x + \cos y)(\cos y + \sin x)$

B) $2(\sin x + \cos y)(\cos y - \sin x)$

C) $2(\sin x + \cos y)(\cos y + \cos x)$

D) $2(\sin x + \cos y)(\cos y - \cos x)$

E) $2(\sin x + \cos y)(\cos x + \sin y)$

F) $2(\sin x + \cos y)(\cos x - \sin y)$

G) $2(\sin x + \cos y)(-\cos x - \cos y)$

H) $2(\sin x + \cos y)(\cos x - \cos y)$

Problem 13

Calculate the iterated integral

$$\int_1^2 \int_0^2 \frac{y}{x}\, dydx$$

A) $\ln 2$

B) $\frac{1}{2}$

C) $\frac{1}{2}\ln 2$

D) $2\ln 2$

E) 2

F) $\frac{2}{\ln 2}$

G) $\frac{1}{\ln 2}$

H) $\ln \frac{1}{2}$

Problem 14

Suppose you have an income stream that produces income of $K(t) = 1000e^{0.1t}$ at time t, and that as you receive the income you invest it at an interest rate of 5% for 10 years. What is the present value of this income stream?

A) \$12,874

B) \$12,924

C) \$12,974

D) \$13,024

E) \$13,074

F) \$13,124

G) \$13,174

H) \$13,224

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Written problem - Show your work

Problem 15

Use Simpson's Rule with $n = 3$ to approximate $\int_0^6 \sqrt{1+x^3}\,dx$ to 4 decimal places.

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Written problem - Show your work

Problem 16

Compute

$$\int_0^\infty \frac{1}{(2x+3)^2}\,dx$$

or show that this integral diverges.