NAME _____

STUDENT ID _____

REC. INSTR. _____ REC. TIME _____

INSTRUCTIONS:

1. Verify that you have all the pages (there are 6 pages).
2. Fill in your name, your student ID number, and your recitation instructor's name and recitation time above. Write your name, your student ID number and division and section number of your recitation section on your answer sheet, and fill in the corresponding circles.
3. Mark the letter of your response for each question on the mark–sense answer sheet.
4. There are 12 problems worth 8 points each.
5. No books or notes or calculators may be used.

Suppose $|f''(x)| \leq K$ for $a \leq x \leq b$. If E_T is the error in the Trapezoidal Rule, then

$$|E_T| \leq \frac{K(b-a)^3}{12n^2} \quad .$$

If the region R lies between the graphs of $y = f(x)$ and $y = g(x)$ where $f(x) \geq g(x)$, then the centroid $(\overline{x}, \overline{y})$ of R is given by:

$$\overline{x} = \frac{1}{A}\int_a^b x(f(x) - g(x))dx,$$

$$\overline{y} = \frac{1}{A}\int_a^b \frac{1}{2}\left((f(x))^2 - (g(x))^2\right)dx,$$

where A is the area of R.

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1. Evaluate $\int_0^2 \frac{1}{(x^2+4)^{\frac{3}{2}}}\,dx$.

A. $\frac{1}{4}$

B. $\frac{\sqrt{2}}{8}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{2}$

E. $\frac{\sqrt{2}}{2}$

2. Which substitution is best suited for calculating the integral $\int \frac{x^2+1}{\sqrt{6x-x^2-5}}\,dx$?

A. $x-3 = 2\sec u$

B. $x-3 = 2\tan u$

C. $x-3 = 2\sin u$

D. $x+3 = 2\sec u$

E. $x = \tan u$

3. $\displaystyle\int_2^3 \frac{3x+3}{x^2+x-2}\,dx =$

A. $\ln 5$

B. $\ln 5 - 4\ln 2$

C. $\ln\left(\frac{5}{4}\right)$

D. divergent

E. $\ln 5 - \ln 6$

4. Find the form of partial fraction decomposition for $\dfrac{1}{(x^3+4x)^2}$.

A. $\dfrac{A}{x} + \dfrac{B}{x^2+4}$

B. $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{C}{x^2+4}$

C. $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{Cx+D}{x^2+4}$

D. $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{Cx+D}{x^2+4} + \dfrac{Ex+F}{(x^2+4)^2}$

E. $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{Cx+D}{x^2+2} + \dfrac{Ex+F}{(x^2+2)^2}$

5. $\int_0^1 e^{\sqrt{x}} dx =$

A. $2(e-1)$

B. 2

C. $2e$

D. $e-1$

E. e

6. Suppose Trapezoidal rule is used to approximate $\int_0^1 f(x)dx$, and $|f''(x)| \leq 6$ on interval $[0,1]$. What is the smallest number of subintervals n that must be used to guarantee that the error $|E_T| \leq 0.001$?

A. 19

B. 21

C. 23

D. 25

E. 27

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

A. $\frac{1}{3}$

B. 3

C. 1

D. the integral diverges

E. $\frac{1}{9}$

8. Find the length of the curve $y = f(x)$, $1 \le x \le 2$, if $f'(x) = \sqrt{4x^6 - 1}$

A. $\frac{512}{7}$

B. 30

C. 24

D. $\frac{13}{2}$

E. $\frac{15}{2}$

9. Find the area of the surface obtained by rotating the curve $y = 2x^2 + 3$, $0 \le x \le 1$, about the y–axis.

A. $\frac{\pi}{24}(17^{\frac{3}{2}} - 1)$

B. $\frac{\pi}{24}(19^{\frac{3}{2}} - 3^{\frac{3}{2}})$

C. $\frac{\pi}{48}(17^{\frac{3}{2}} - 1)$

D. $\frac{\pi}{48}(19^{\frac{3}{2}} - 3^{\frac{3}{2}})$

E. $\frac{8\pi}{3}$

10. Find the x–coordinate of the centroid of the region in the first quadrant bounded by $y = x^2$ and $y = x^4$.

A. $\frac{1}{3}$

B. $\frac{3}{8}$

C. $\frac{1}{2}$

D. $\frac{5}{8}$

E. $\frac{2}{3}$

11. $\lim_{n\to\infty} \frac{5n-7}{\sqrt{4n^2+6n+1}} =$

A. 0

B. 1

C. $\frac{5}{4}$

D. ∞

E. $\frac{5}{2}$

12. $\lim_{n\to\infty} \frac{(n!)\sqrt{n^2+1}}{((n+1)!)} =$

A. ∞

B. $\sqrt{2}$

C. 1

D. e

E. 0