Name:_____ ID:_____

Recitation Instructor:_____ Recitation Time:_____

**Instructions:** Give a complete answer to each problem in the space provided, if necessary. Be sure to **show all your work**. Answers not supported by work will receive little credit. **Write the answer to each question in the box provided.** Write your name and ID number on each page of the exam. Also write your Recitation Instructor's name and Recitation time above. No books, notes or calculators may be used on this exam. This exam has 5 pages.

1. **(10 points)** $\int \sin^2 x \cos^3 x \, dx =$

2. **(10 points)** $\int \dfrac{1}{x^2 \sqrt{x^2 - 4}} \, dx =$

Name:_____ ID:_____

3. **(10 points)** Use the integral test to determine whether $\sum_{n=1}^{\infty} ne^{-n}$ converges or diverges.

The sum_____ since

4. **(6 points)** Write out the form of the partial fraction decompostion of the function

$$\frac{x^3 + 2x^2 + 5x + 4}{(2x+3)^2(x-1)(x^2+9)}.$$

Do not determine the numerical values of the coefficients.

Name:_____ ID:_____

5. **(12 points)** Match the integration technique with the integral by writing the letter of the integral next to the technique most likely to produce an antiderivative formula.

A. $\displaystyle\int_0^2 \frac{x^2}{x^4 + x^2 - 27}\, dx$          _____ Integration by parts

B. $\displaystyle\int_0^2 \frac{x^2}{\sqrt{25 - 4x^2}}\, dx$          _____ Trigonometric integrals
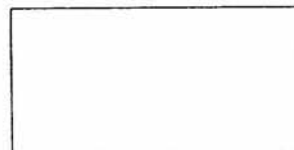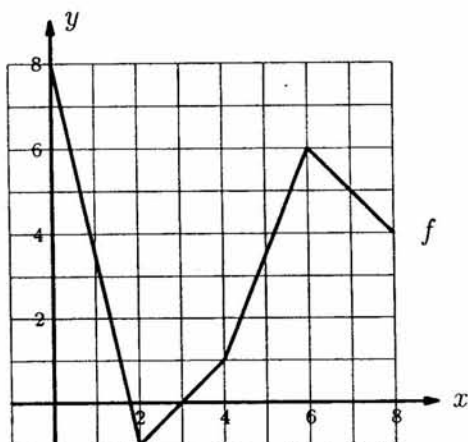
C. $\displaystyle\int_0^2 x^2 \sin x \, dx$          _____ Trigonometric substitution

D. $\displaystyle\int_0^2 \frac{\tan x}{\cos^2 x}\, dx$          _____ Partial fractions

E. $\displaystyle\int_0^2 \cos(x^2)\, dx$          _____ Improper integrals

F. $\displaystyle\int_0^2 \frac{1}{1 - x}\, dx$          _____ Approximate integration

6. **(8 points)** <u>Use Simpson's method</u> with $n = 4$ to approximate $\displaystyle\int_0^8 f(x)\, dx$ where $y = f(x)$ is given by the graph below.

Name:_____ ID:_____

7. **(8 points)** The curve $y = \sin(x^2)$,    $0 \le x \le \pi$,    is rotated about the $x$–axis. Set up an integral (do not evaluate it) that gives the surface area of the surface of revolution.

surface area =

8. **(9 points)** Find the sum of the geometric series $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}2^n}{3^{n-1}}$

Name:_____ ID:_____

**9. (9 points each)** Which of the following series converge. **Be sure to give the reasons for your answers.** (Note: You do not need to evaluate any of these series, just determine whether or not they converge.)

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{n^3 + 4}{n^3}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{7 + 4^n}{9^n}$

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{\ln(3n)}{2n}$