

Name _____.

Show all work where appropriate for full credit. There are 100 points possible. You have 60 minutes to work. There are four pages in this exam. Please *circle* or write your final answers in the spaces provided!

Evaluate the following integrals.

1. (10pts) $\int \frac{x}{x^2 - 1} dx$ 1 _____.

2. (10pts) $\int \frac{e^{2\sqrt{x}}}{\sqrt{x}} dx$ 2 _____.

3. (10pts) **Graph** and **compute** the **area** between the curves $x = -y^2 + 2$ and $x = -y$.

3 _____.

4. (15pts) Find the **volume** of the solid generated by rotating the region bound by $y = 1 + \frac{1}{x}$, $x = 1$, $x = 4$, and $y = 1$ about the x -axis. [Hint: Graph the region and determine which method to use.]

4 _____.

5. (15pts) Find the **volume** of the solid generated by rotating the region bound by $y = 3x - x^2$ and the x -axis about the line $x = 5$.

5 _____.

6. (15pts) Find the **length** of the curve given by $x = \frac{y^{3/2}}{3} - y^{1/2}$ from $y = 1$ to $y = 4$ (you do *not* need to graph the curve, just simply find the curve length). [Hint: What you hope to be a perfect square is such.]

7. (15pts) Find the following **derivatives**.

(a) $f(x) = 5^{x^2+x+1}$

(a) _____.

(b) $y = \tan^{-1} x + \log_5 x$

(b) _____.

8. (10pts) Evaluate the integral.

8 _____.

$$\int 3^{\cos x} \sin x \, dx$$

Name _____.

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Find the following elementary antiderivatives.

1. (10pts) $\int \frac{1}{x^2 \sqrt{25 - x^2}} dx$ 1 _____.

2. (15pts) $\int \frac{e^x}{\sqrt{e^{2x} + 9}} dx$ 2 _____.

3. (10pts) $\int \frac{\sqrt{x^2 - 1}}{x} dx$

3 _____.

4. (15pts) $\int x \ln x dx$

4 _____.

5. (10pts) $\int \sin^3 x \cos^2 x \, dx$

5 _____.

6. (15pts) $\int \sin^2 x \cos^2 x \, dx$

6 _____.

7. (10pts) $\int \frac{x^2 + 2x + 2}{x^2 + 1} dx$

7_____.

8. (15pts) $\int \frac{1}{(x - 2)(x^2 + 1)} dx$

8_____.

Name _____.

Show all work where appropriate for full credit. There are 100 points possible. You have 50 minutes to work. There are four pages in this exam. Please *circle* or write your final answers in the spaces provide. Good luck!

1. (10pts) **Solve** the differential equation

1 _____.

$$y' \ln y = \frac{xy}{2}.$$

2. (20pts) **Determine** whether the following sequences converge or diverge. If they converge, **find** their limit.

(a) $a_n = \frac{2 + 5n^2}{n + 2n^2}$

a _____.

(b) $a_n = 5 + \cos n\pi$

b _____.

(c) $a_n = \sqrt{n+1} - \sqrt{n}$

c _____.

(d) $a_n = (-1)^n \frac{3n}{n^2 + 5}$

d _____.

3. (10pts) **Determine** whether the following *series* converges or diverges. If it converges, **find** its sum.

$$\sum_{n=1}^{\infty} 5^{-n} 3^{n+1}$$

3 _____.

4. (25pts) Determine whether the following series **converge** or **diverge**, referencing all tests used. Do not attempt to find sums, if they converge.

(a) $\sum_{n=1}^{\infty} n e^{-n^2}$

a _____.

(b) $\sum_{n=1}^{\infty} \frac{5}{1 + 3^n}$

b _____.

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

c _____.

5. (35pts) Determine whether the following series converge **absolutely**, **conditionally**, or **neither**, referencing all tests used. Do not find sums, if they converge in either sense.

(a) $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^{2/3}}$

a _____.

(b) $\sum_{n=1}^{\infty} \frac{\sqrt{n} + 3}{1 + 5\sqrt{n}}$

b _____.

(c) $\sum_{n=1}^{\infty} \frac{\cos(n\pi/6)}{n\sqrt{n}}$

c _____.

(d) $\sum_{n=0}^{\infty} \frac{(-2)^n}{n!}$

d _____.