

Name \_\_\_\_\_ Section \_\_\_\_\_

MATH 152

FINAL EXAM Version B

Spring 2016

Sections 555-557

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1-13	/52
14	/20
15	/20
16	/5
17	/5
18	/5
Total	/107

Multiple Choice: (13 problems, 4 points each)

1.

**Average Value of a Function**

New Problem or Modify or Make Your Own Problem

Find the average value of the function  $f(x) = \sin(x)$  on the interval  $[a,b] = [0,\pi]$ .

- a.  $\frac{1}{\pi}$
- b.  $\frac{2}{\pi}$
- c. 1
- d. 2
- e.  $2\pi$

2.

**Integrals Which are Improper at an Endpoint**

New Problem

Problem Statement:

Determine if the following improper integral is convergent or divergent.

$$\int_{-2}^{\infty} (x+4)^{-\frac{1}{3}} dx$$

If convergent, compute it.

If divergent, determine if it is +infinity, -infinity, or neither.

- a. converges to  $\frac{3}{2^{1/3}}$
- b. converges to  $-\frac{3}{2^{1/3}}$
- c. diverges to  $-\infty$
- d. diverges to  $\infty$
- e. diverges but not to  $\pm\infty$

3.

**Integration By Parts**

Use integration by parts  
 to compute the integral:

$$J = \int_0^2 x e^{-x} dx$$

- a.  $-e^{-2}$
- b.  $-e^{-2} - 1$
- c.  $1 - e^{-2}$
- d.  $1 - 3e^{-2}$
- e.  $1 + e^{-2}$

4.

**Trigonometric Integrals**

Use a substitution  
 to compute the integral:

$$J = \int_0^{\frac{1}{2}\pi} \sin^3 x dx$$

- a.  $-\frac{4}{3}$
- b.  $-\frac{1}{4}$
- c.  $\frac{1}{4}$
- d.  $\frac{2}{3}$
- e.  $\frac{4}{3}$

5.

**Integration by Trigonometric Substitution**

New Integral

Goal: Evaluate the indefinite integral using a trigonometric substitution:

$$I = \int (x^2 + 16)^{-\frac{3}{2}} dx$$

Simply identify the integral after the substitution.

- a.  $\frac{1}{16} \int \csc^2 \theta d\theta$
- b.  $\frac{1}{64} \int \sec^2 \theta d\theta$
- c.  $\frac{1}{16} \int \sin^3 \theta d\theta$
- d.  $\frac{1}{64} \int \cos^3 \theta d\theta$
- e.  $\frac{1}{16} \int \cos \theta d\theta$

6.

**Partial Fractions: Finding Coefficients**

New Function  Include Completing the Square

Goal: Find the coefficients in the partial fraction expansion:

$$\frac{-2x^2 - x + 2}{x^2(x-1)} = \frac{A_1}{x} + \frac{A_2}{x^2} + \frac{A_3}{x-1}$$

Just find  $A_1$  and  $A_2$ .

- a.  $A_1 = 1 \quad A_2 = 2$
- b.  $A_1 = -1 \quad A_2 = -2$
- c.  $A_1 = 2 \quad A_2 = 1$
- d.  $A_1 = -2 \quad A_2 = -1$
- e.  $A_1 = -2 \quad A_2 = 1$

7.

**Volume Of Revolution** \_ □ ×

New Problem or Modify or Make Your Own Problem Quit

The region above  $y = 2x^2$ , below  $y = 4x$ , between  $x = 0$  and  $x = 2$  is rotated about the  $x$ -axis. Find the volume swept out.

- a.  $\frac{256}{15}\pi$
- b.  $\frac{16}{15}\pi$
- c.  $\frac{256}{3}\pi$
- d.  $\frac{16}{3}\pi$
- e.  $\frac{8}{3}\pi$

8.

**Volume Of Revolution** \_ □ ×

New Problem or Modify or Make Your Own Problem Quit

The region above  $y = 2x^2$ , below  $y = 4x$ , between  $x = 0$  and  $x = 2$  is rotated about the  $y$ -axis. Find the volume swept out.

- a.  $\frac{256}{15}\pi$
- b.  $\frac{16}{15}\pi$
- c.  $\frac{256}{3}\pi$
- d.  $\frac{16}{3}\pi$
- e.  $\frac{8}{3}\pi$

9.

**Surface Area Of Solid Of Revolution**

New Problem or Modify or Make Your Own Problem

The curve  $x = \frac{2}{3}y^2$ , between  $y = 0$  and  $y = 1$ , is rotated about the  $x$ -axis. Find the surface area of the surface of revolution.

- a.  $\frac{126}{72}\pi$
- b.  $\frac{49}{36}\pi$
- c.  $\frac{49}{144}$
- d.  $\frac{49}{72}$
- e.  $\frac{49}{36}$

10.

**Work to Lift an Object with a Rope**

New Problem

Goal:

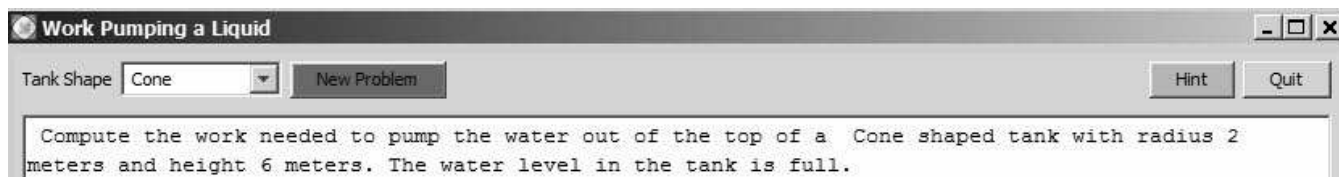
Find the work needed to lift a 10 lb object up a 20 ft building using a rope whose density is 5 lb/ft.

- a. 200 ft-lb
- b. 500 ft-lb
- c. 700 ft-lb
- d. 1000 ft-lb
- e. 1200 ft-lb



Work Out (5 questions, Points indicated. Show all you work.)

14. (20 points)



Write your answer as a multiple of  $\rho g$  where  $\rho$  is the density of water and  $g$  is the acceleration of gravity. The vertex of the cone is at the bottom.

15. (20 points)

Center And Radius of Convergence of a Power Series

Goal: Find the center and radius of convergence of the series:

New Series

$$\sum_{n=1}^{\infty} \frac{n(x-8)^n}{4^n}$$

Also find the interval of convergence by checking the endpoints.

a. (2 pts) Identify the center:

$a =$  \_\_\_\_\_

b. (8 pts) Find the radius of convergence:

$R =$  \_\_\_\_\_

c. (8 pts) Check the endpoints:

d. (2 pts) Summarize the interval of convergence:

$I =$  \_\_\_\_\_



16. (5 points) Determine whether the series  $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{1/3}}$  is absolutely convergent, convergent but not absolutely or divergent. Explain all tests you use.

17. (5 points) The series  $S = \sum_{n=1}^{\infty} \frac{1}{n^2 + 1}$  converges by the Integral Test.

If it is approximated by its 100<sup>th</sup> partial sum  $S_{100}$ , compute the integral bound on the error in this approximation.

18. (5 points) Compute the sum of the series  $\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n+1}}{(2n+1)! 3^{2n+1}}$ .