

Name _____

MATH 172H

Exam 2

Spring 2019

Sections 200

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11 Multiple Choice: (5 points each. No part credit.)

1. Consider the integrals:

$$A = \int_3^4 \frac{1}{(x-3)^{2/3}} dx \quad B = \int_3^4 \frac{1}{(x-3)^{4/3}} dx \quad C = \int_4^{\infty} \frac{1}{(x-3)^{2/3}} dx \quad D = \int_4^{\infty} \frac{1}{(x-3)^{4/3}} dx$$

Which are finite? Which are infinite?

- a. A and B are finite. C and D are infinite.
- b. B and C are finite. A and D are infinite.
- c. B and D are finite. A and C are infinite.
- d. A and D are finite. B and C are infinite.
- e. A and C are finite. B and D are infinite.

2. Compute $\int_0^1 \frac{1}{\sqrt{1-x^2}} dx$.

- a. π
- b. $\frac{\pi}{2}$
- c. $\frac{\pi}{4}$
- d. 0
- e. divergent

1-11	/55	13	/22
12	/15	14	/12
		Total	/104

3. Which of the following terms does NOT belong in the general partial fraction expansion of

$$\frac{x^3 - 6x^2 + 7}{(x - 4)(x - 3)^2(x^2 + 4)(x^2 + 9)^3}$$

- a. $\frac{A}{(x - 4)}$
b. $\frac{B}{(x - 3)^2}$
c. $\frac{Cx + D}{(x^2 + 9)}$
d. $\frac{Ex + F}{(x^2 + 9)^3}$
e. They all belong.
4. In the partial fraction expansion $\frac{x}{(x - 2)(x - 3)^3} = \frac{A}{x - 2} + \frac{B}{x - 3} + \frac{C}{(x - 3)^2} + \frac{D}{(x - 3)^3}$ which coefficient is INCORRECT?

- a. $A = -2$
b. $B = 2$
c. $C = -3$
d. $D = 3$
e. They are all correct.

5. Find the location of the vertical tangents to the parametric curve:

$$x = t^3 - 3t \quad y = t^2 - 4t$$

- a. $(-2, -3)$ and $(2, 5)$ only
 - b. $(-2, -3)$, $(2, -4)$ and $(2, 5)$ only
 - c. $(-2, -3)$ and $(2, -4)$ only
 - d. $(2, -4)$ only
 - e. $(2, -4)$ and $(2, 5)$ only
6. The base of a solid is the region between $y = x^2$ and the x -axis for $0 \leq x \leq 3$. The cross sections perpendicular to the x -axis are squares. Find the volume of the solid.
- a. $\frac{3^4}{4}$
 - b. $\frac{3^5}{5}$
 - c. 9
 - d. 27
 - e. 81

7. The region between $y = x^2$ and the x -axis for $0 \leq x \leq 4$ is rotated about the y -axis. Find the volume swept out.

- a. 8π
- b. 16π
- c. 32π
- d. 64π
- e. 128π

8. The region between $y = x^2$ and the x -axis for $0 \leq x \leq 4$ is rotated about the x -axis. Find the volume swept out.

- a. $\frac{1024\pi}{5}$
- b. 64π
- c. $\frac{64\pi}{3}$
- d. 32π
- e. $\frac{32\pi}{3}$

9. It takes a 40 N force to stretch a certain spring to 8 m from its rest position. How much work does it take to stretch this spring from 1 m from rest to 9 m from rest.

- a. 25 J
- b. 50 J
- c. 100 J
- d. 200 J
- e. 400 J

10. A 100 foot rope weighs $\delta = 2 \frac{\text{lb}}{\text{foot}}$. It is hanging from the top of a 100 foot tall building. How much work is done to pull it up to the top of the building.

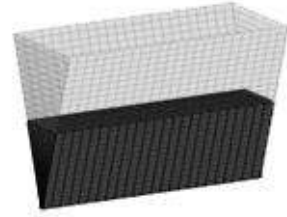
- a. 5000
- b. 10000
- c. 20000
- d. $\frac{100^3}{3}$
- e. $2\frac{100^3}{3}$

11. Find the solution of the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2}$ satisfying $y(1) = 4$. Then $y(0) =$

- a. $\sqrt[3]{7}$
- b. $\sqrt[3]{21}$
- c. $\sqrt[3]{63}$
- d. $\sqrt[3]{65}$
- e. $\sqrt[3]{195}$

Work Out: (Points indicated. Part credit possible. Show all work.)

12. (15 points) A water trough is 18 meters long. Its end is an isosceles triangle with vertex down whose width is 8 meters and height is 12 meters. The trough is filled with water to a depth of 6 meters. How much work is done to pump the water out the top of the tank?
Answers can be given as a multiple of δg where δ is the density of water g is the acceleration of gravity is g .



13. (22 points) A pot of syrup on a stove initially contains 4 cups of sugar in 16 gallons of water. Sugar water containing 2 cups of sugar per gallon is added at 3 gallons per hour. Pure water boils off at 1 gallon per hour. The syrup is kept well mixed and is drained at 2 gallons per hour. Let $S(t)$ be the cups of sugar in the pot after t hours.

a. Find the differential equation and initial condition satisfied by $S(t)$.

b. Solve for $S(t)$.

c. After a very large time, how many cups of sugar will be in the pot?

14. (12 points) Given the partial fraction expansion $\frac{10x^2 - 60}{(x - 4)^2(x^2 + 4)} = \frac{2}{x - 4} + \frac{5}{(x - 4)^2} + \frac{-2x - 3}{x^2 + 4}$

Compute $\int \frac{10x^2 - 60}{(x - 4)^2(x^2 + 4)} dx$.