

Math 126
Spring 2017
Dr. Lily Yen

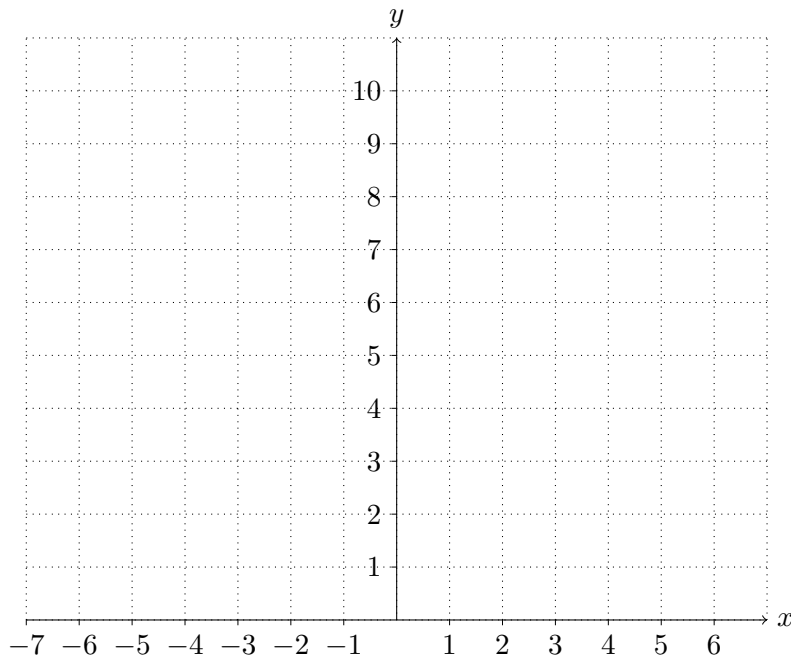
Test 2

Show all your work

Name: _____
Number: _____
Signature: _____
Score: ____/40

No Calculator permitted in this part. Read the questions carefully. Show all your work and clearly indicate your final answer. Use proper notation.

Problem 1: Draw $y = 2^x$ and $x = \frac{3}{7}(y - 1)(y - 7)$ on the grid. One of the intersections of these two curves is $(3, 8)$. Shade the region bounded by these two curves.



Use integrals to express the following. **DO NOT EVALUATE YOUR INTEGRALS.** Draw a cross-sectional strip for each solid of rotation.

- a. The area of the shaded region.

Score: /2

- b. The volume of a solid that has the shaded region as its base, and cross-sections perpendicular to the y -axis are semi-circles.

Score: /2

- c. The volume of the solid obtained by rotating the region around $x = -6$.

Score: /2

- d. The volume of the solid obtained by rotating the region around $y = 10$.

Score: /2

Problem 2: Evaluate the following integrals analytically.

a. $\int x^3 e^{x^2} dx$

Score: /3

b. $\int e^{-x} \cos(2x) dx$

Score: /4

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

Score: /5

Test 2

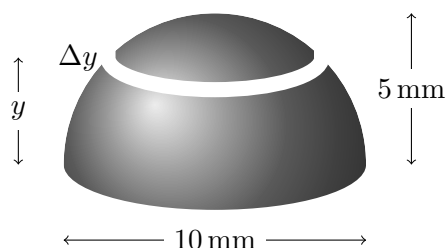
Show all your work

Name: _____

Number: _____

Calculators permitted from here on.

Problem 3: Write a Riemann sum and then a definite integral representing the volume of the hemisphere, using the slice shown. Evaluate the integral exactly.



Score: /4

Problem 4: Evaluate if possible; otherwise, state why the integral does not exist.

$$\int_1^3 \frac{1}{(x-2)^2} dx$$

Score: /4

Problem 5: Suppose that f is continuous for all real numbers and that $\int_0^\infty f(x) dx$ converges to a real number, c . Let a be any positive number. Decide which of the statements below are true and which are false. Give an explanation for your answer.

a. $\int_0^\infty af(x) dx$ converges.

c. $\int_0^\infty f(ax) dx$ converges.

b. $\int_0^\infty f(x+a) dx$ converges.

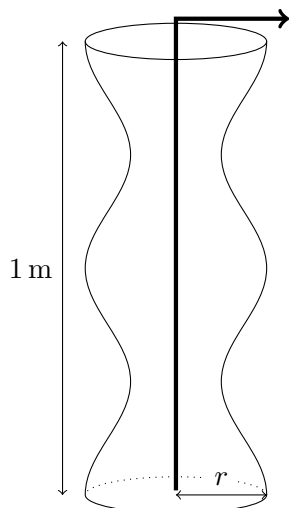
d. $\int_0^\infty (a+f(x)) dx$ converges.

Score: /4

Problem 6: A 20 m uniform chain with a mass density of 1.5 kg/m is dangling from the roof of a building. How much work is required to pull half the chain up onto the top of the building? Use $g = 9.81 \text{ m/s}^2$. Provide your answer accurate to 2 decimal places.

Score: /4

Problem 7: A display fish tank has a circular cross section with radius r metres at a height of y metres above the ground given by $r = (3 + \cos(4\pi y))/100$. The height of the tank is 1 m. A spout is placed 0.05 m above the tank. Find the work required to pump all the water from a full tank out through the spout. Provide your answer accurate to the nearest integer. Hint: 1 m^3 of water has a mass of 1000 kg. (Drawing is not to scale.)



Score: /4