Chap 8 HW -- Further Application (11708643)

Due: Sat, Jun 1, 2019 12:00 PM MST

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

1. Question Details SCalcET8 8.5.001. [3806098]

Let $f(x)$ be the probability density function for the lifetime of a manufacturer's highest quality car tire, where x is measured in miles. Explain the meaning of each integral.

(a) $\int_{20,000}^{50,000} f(x)\,dx$

- The integral is the probability that a randomly chosen tire will have a lifetime between 20,000 and 50,000 miles.
- The integral is the probability that a randomly chosen tire will have a lifetime of exactly 50,000 miles.
- The integral is the probability that a randomly chosen tire will have a lifetime under 50,000 miles.
- The integral is the probability that a randomly chosen tire will have a lifetime of at least 20,000 miles.

(b) $\int_{15,000}^{\infty} f(x)\,dx$

- The integral is the probability that a randomly chosen tire will have a lifetime of exactly 15,000 miles.
- The integral is the probability that a randomly chosen tire will not wear out.
- The integral is the probability that a randomly chosen tire will have a lifetime of at least 15,000 miles.
- The integral is the probability that a randomly chosen tire will have a lifetime under 15,000 miles.

2. Question Details SCalcET8 8.5.002. [3805875]

Let $f(t)$ be the probability density function for the time it takes you to drive to school in the morning, where t is measured in minutes. Express the following probabilities as integrals. (If you need to use ∞ or −∞, enter INFINITY or −INFINITY, respectively.)

(a) The probability that you drive to school in less than 50 minutes

$\int_{\square}^{\square} f(t)\,dt$

(b) The probability that it takes you more than half an hour to get to school

$\int_{\square}^{\square} f(t)\,dt$

3. Question Details SCalcET8 8.5.005.MI.SA. [3806053]

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Let $f(x) = \dfrac{c}{1 + x^2}$.

Exercise (a)

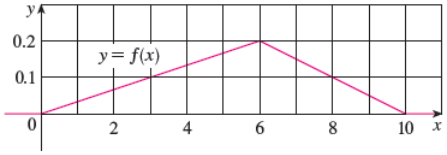
For what value of c is f a probability density function?

Exercise (b)

For that value of c, find $P(-2 < X < 2)$.

4. Question Details SCalcET8 8.5.008. [3806264]

Consider the following function whose graph is shown.



(a) Explain why the function whose graph is shown above is a probability density function.

- The values of both endpoints of the function are 0.
- The total area under the function is 1.
- The integral of the function is 10.
- The highest value of the function is 0.2.
- The derivative of the function is constant.

(b) Use the graph to find the following probabilities. (Round your answers to three decimal places.)

(i) $P(X < 3)$

(ii) $P(3 \le X \le 8)$

(c) Calculate the mean. (Round your answer to three decimal places.)

5. Question Details SCalcET8 8.5.014. [3805828]

According to the National Health Survey, the heights of adult males in the United States are normally distributed with mean 69.0 inches and standard deviation 2.8 inches.

(a) What is the probability that an adult male chosen at random is between 64 and 74 inches tall? (Round your answer to three decimal places.)

(b) What percentage of the adult male population is more than 6 feet tall? (Round your answer to one decimal place.)
%

6. Question Details SCalcET8 8.5.015. [3806288]

The "Garbage Project" at the University of Arizona reports that the amount of paper discarded by households per week is normally distributed with mean 9.4 lb and standard deviation 4.2 lb. What percentage of households throw out at least 10 lb of paper a week? (Round your answer to one decimal place.)
%

7. Question Details SCalcET8 8.5.502.XP.MI.SA. [3805917]

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

The manager of a fast-food restaurant determines that the average time that her customers wait for service is 3.5 minutes.

Exercise (a)

Find the probability that a customer has to wait more than 5 minutes.

Exercise (b)

Find the probability that a customer is served within the first 2 minutes.

Exercise (c)

The manager wants to advertise that anybody who isn't served within a certain number of minutes gets a free hamburger. But she doesn't want to give away free hamburgers to more than 1% of her customers. What number of minutes should the advertisement use?

8. Question Details SCalcET8 8.5.011. [3806192]

An online retailer has determined that the average time for credit card transactions to be electronically approved is 1.9 seconds. (Round your answers to three decimal places.)

(a) Use an exponential density function to find the probability that a customer waits less than a second for credit card approval.

(b) Find the probability that a customer waits more than 3 seconds.

(c) What is the minimum approval time for the slowest 5% of transactions?
sec

9. Question Details SCalcET8 8.1.501.XP.MI.SA. [3804617]

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Tutorial Exercise

Find the exact length of the curve.

$y^2 = 16(x + 2)^3, \quad 0 \le x \le 2, \quad y > 0$

10. Question Details SCalcET8 8.1.002. [3805611]

Use the arc length formula to find the length of the curve $y = \sqrt{2 - x^2}$, $0 \le x \le 1$. Check your answer by noting that the curve is part of a circle.

11. Question Details SCalcET8 8.1.007. [3805563]

Set up an integral that represents the length of the curve. Then use your calculator to find the length correct to four decimal places.

$x = \sqrt{y} - 2y, \quad 1 \le y \le 4$

$\int_1^{\square}$ $\square$ dy = $\square$

12. Question Details SCalcET8 8.1.011. [3805012]

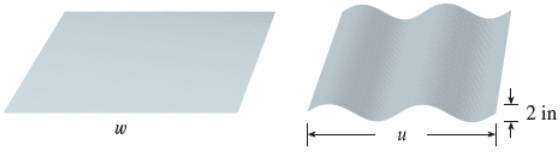
Find the exact length of the curve.

$y = \frac{x^3}{3} + \frac{1}{4x}, \quad 1 \le x \le 2$

13. Question Details SCalcET8 8.1.043. [3805180]

A manufacturer of corrugated metal roofing wants to produce panels that are $u = 36$ in. wide and 2 in. thick by processing flat sheets of metal as shown in the figure. The profile of the roofing takes the shape of a sine wave with equation $y = \sin(\pi x/9)$. Find the width w of a flat metal sheet that is needed to make a 36-inch panel. (Use your calculator to evaluate the integral correct to four significant digits.)

in.



14. Question Details SCalcET8 8.2.AE.002. [3805480]

Video Example

EXAMPLE 2 The arc of the parabola $y = 5x^2$ from $(2, 20)$ to $(6, 180)$ is rotated about the y-axis. Find the area of the resulting surface.

SOLUTION 1 Using

$y = 5x^2$ and $\frac{dy}{dx} =$ [ ]

we have, from this formula,

$$S = \int 2\pi x \, ds$$

$$= \int_2^6 2\pi x \sqrt{1 + \left(\frac{dy}{dx}\right)^2} \, dx$$

$$= 2\pi \int_2^6 x \sqrt{1 + 100x^2} \, dx.$$

Substituting $u = 1 + 100x^2$, we have $du =$ [ ] dx. Remembering to change the limits of integration, we have

$$S = \frac{\pi}{100} \int_{401}^{3601} \sqrt{u} \, du$$

$$= \frac{\pi}{100} \left[\quad \right]_{401}^{3601}$$

$$= \quad .$$

SOLUTION 2 Using

$x = \sqrt{\frac{y}{5}}$ and $\frac{dx}{dy} =$ [ ]

we have

$$S = \int 2\pi x \, ds = \int_{20}^{180} 2\pi x \sqrt{1 + \left(\frac{dx}{dy}\right)^2} \, dy$$

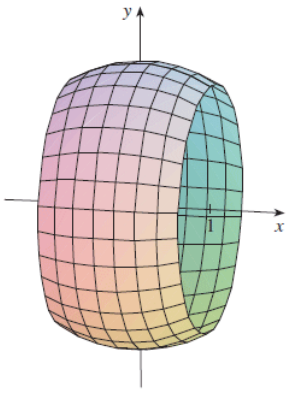
$$= 2\pi \int_{20}^{180} \sqrt{\frac{y}{5}} \sqrt{1 + \frac{1}{20y}} \, dy$$

$$= \frac{\pi}{5} \int_{20}^{180} \sqrt{20y + 1} \, dy$$

$$= \frac{\pi}{100} \int_{401}^{3601} \sqrt{u} \, du \quad (\text{where } u = 1 + 20y)$$

$$= \quad \text{(as in Solution 1)}$$

15. Question Details SCalcET8 8.2.AE.001. [3805458]



This figure shows the portion of the sphere whose surface area is computed in the example.

Video Example

EXAMPLE 1 The curve $y = \sqrt{49 - x^2}$, $-1 \le x \le 1$, is an arc of the circle $x^2 + y^2 = 49$. Find the area of the surface obtained by rotating this arc about the x-axis. (The surface is a portion of a sphere of radius 7. See the figure.)

SOLUTION We have

$$\frac{dy}{dx} = \frac{1}{2}(49 - x^2)^{-1/2}\left(\quad\right)$$

$$= \frac{-x}{\sqrt{49 - x^2}}$$

and so, by this formula, the surface area is

$$S = \int_{-1}^{1} 2\pi y \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$$

$$= 2\pi \int_{-1}^{1} \sqrt{49 - x^2} \sqrt{1 + \frac{x^2}{49 - x^2}}\, dx$$

$$= 2\pi \int_{-1}^{1} \sqrt{49 - x^2} \frac{\quad}{\sqrt{49 - x^2}}\, dx$$

$$= 14\pi \int_{-1}^{1} 1\, dx$$

$$= \quad .$$

16. Question Details SCalcET8 8.2.AE.003. [3804893]

Video Example

EXAMPLE 3 Find the area of the surface generated by rotating the curve $y = e^{3x}$, $0 \le x \le 4$, about the x-axis.

SOLUTION Using this formula with

$$y = e^{3x} \quad \text{and} \quad \frac{dy}{dx} = \quad$$

we have

$$S = \int_0^4 2\pi y \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$$

$$= 2\pi \int_0^4 e^{3x} \sqrt{1 + 9e^{6x}}\, dx$$

$$= \frac{2}{9}\pi \int_3^{3e^{12}} \sqrt{1 + u^2}\, du \quad (\text{where } u = 3e^{3x})$$

$$= \frac{2}{9}\pi \int_\beta^\alpha \sec^3(\theta)\, d\theta \quad (\text{where } u = \tan(\theta),\ \alpha = \tan^{-1}(3e^{12}), \text{ and } \beta = \tan^{-1}(3))$$

$$= \frac{2}{9}\pi \cdot \frac{1}{2}\left[\quad + \ln(|\sec(\theta) + \tan(\theta)|)\right]_\beta^\alpha \quad (\text{by this example})$$

$$= \frac{\pi}{9}\left[\sec(\alpha)\tan(\alpha) + \ln(\sec(\alpha) + \tan(\alpha)) - 3\sqrt{10} - \ln\left(\sqrt{10} + 3\right)\right].$$

Since $\tan(\alpha) = 3e^{12}$, we have $\sec^2(\alpha) = 1 + \tan^2(\alpha) = 1 + 9e^{24}$ and

$$S = \frac{\pi}{9}\left[3e^{12}\sqrt{1 + 9e^{24}} + \ln\left(3e^{12} + \sqrt{1 + 9e^{24}}\right) - 3\sqrt{10} - \ln\left(\sqrt{10} + 3\right)\right].$$

17. Question Details SCalcET8 8.2.514.XP. [3805047]

Set up, but do not evaluate, an integral for the area of the surface obtained by rotating the curve about the x-axis and the y-axis.

$y = x^8, \ 0 \le x \le 1$

(a) about the x-axis

- $\int_0^1 2\pi x^8 \sqrt{1 + 64x^{14}}\, dx$
- $\int_0^1 2\pi x \sqrt{1 + 64x^{14}}\, dx$
- $\int_0^1 2\pi \sqrt{1 + 64y^{14}}\, dy$
- $\int_0^1 2\pi y \sqrt{1 + 64y^{14}}\, dy$
- $\int_0^1 2\pi \sqrt{1 + 64x^{14}}\, dx$

(b) about the y-axis

- $\int_0^1 2\pi \sqrt{1 + 64y^{14}}\, dy$
- $\int_0^1 2\pi \sqrt{1 + 64x^{14}}\, dx$
- $\int_0^1 2\pi x^8 \sqrt{1 + 64x^{14}}\, dx$
- $\int_0^1 2\pi x \sqrt{1 + 64x^{14}}\, dx$
- $\int_0^1 2\pi y \sqrt{1 + 64y^{14}}\, dy$

18. Question Details SCalcET8 8.2.506.XP. [3805537]

Set up, but do not evaluate, an integral for the area of the surface obtained by rotating the curve

$y = xe^{-x}, \ 2 \le x \le 5$

(a) about the x-axis.

- $\int_2^5 2\pi x \sqrt{1 + e^{-2x}(1 - x)^2}\, dx$
- $\int_2^5 2\pi y \sqrt{1 + e^{-2y}(1 - y)^2}\, dy$
- $\int_2^5 2\pi x e^{-x} \sqrt{1 + e^{-2x}(1 - x)^2}\, dx$
- $\int_2^5 2\pi \sqrt{1 + e^{-2x}(1 - x)^2}\, dx$
- $\int_2^5 2\pi \sqrt{1 + e^{-2y}(1 - y)^2}\, dy$

(b) about the y-axis.

- $\int_2^5 2\pi x \sqrt{1 + e^{-2x}(1 - x)^2}\, dx$
- $\int_2^5 2\pi x e^{-x} \sqrt{1 + e^{-2x}(1 - x)^2}\, dx$
- $\int_2^5 2\pi \sqrt{1 + e^{-2x}(1 - x)^2}\, dx$
- $\int_2^5 2\pi \sqrt{1 + e^{-2y}(1 - y)^2}\, dy$
- $\int_2^5 2\pi y \sqrt{1 + e^{-2y}(1 - y)^2}\, dy$

19. Question Details SCalcET8 8.2.007. [3805279]

Find the exact area of the surface obtained by rotating the curve about the x-axis.

$y = x^3, \quad 0 \le x \le 5$

20. Question Details SCalcET8 8.2.501.XP. [3805561]

Find the exact area of the surface obtained by rotating the curve about the x-axis.

$4x = y^2 + 12, \quad 3 \le x \le 6$

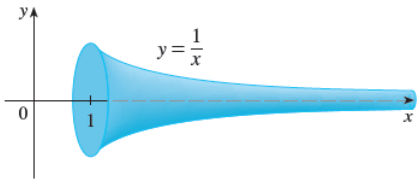
21. Question Details SCalcET8 8.2.014. [3805286]

Find the exact area of the surface obtained by rotating the curve about the x-axis.

$x = 3 + 5y^2, \quad 1 \le y \le 2$

22. Question Details SCalcET8 8.2.027. [3805259]

If the region $\mathcal{R} = \{(x, y) \mid x \ge 1, 0 \le y \le 1/x\}$ is rotated about the x-axis, the volume of the resulting solid is finite. Determine the surface area. (The surface is shown in the figure and is known as **Gabriel's horn**.)



23. Question Details SCalcET8 8.3.001. [3804955]

An aquarium 5 ft long, 1 ft wide, and 5 ft deep is full of water. (Recall that the weight density of water is 62.5 lb/ft^3.)

(a) Find the hydrostatic pressure on the bottom of the aquarium.

lb/ft^2

(b) Find the hydrostatic force on the bottom of the aquarium.

lb

(c) Find the hydrostatic force on one end of the aquarium.

lb

24. Question Details SCalcET8 8.3.015. [3805067]

A cube with 15-cm-long sides is sitting on the bottom of an aquarium in which the water is one meter deep. (Round your answers to the nearest whole number. Use 9.8 m/s^2 for the acceleration due to gravity. Recall that the weight density of water is 1000 kg/m^3.)

(a) Estimate the hydrostatic force on the top of the cube.

N

(b) Estimate the hydrostatic force on one of the sides of the cube.

N

25. Question Details SCalcET8 8.3.021. [3805464]

Point-masses m_i are located on the x-axis as shown. Find the moment M of the system about the origin and the center of mass $\bar{x}$.

M =

$\bar{x}$ =

Flash Player version 10 or higher is required for this question.
You can get Flash Player free from Adobe's website.

26. Question Details SCalcET8 8.3.022. [3804863]

Point-masses m_i are located on the x-axis as shown. Find the moment M of the system about the origin and the center of mass $\bar{x}$.

M =

$\bar{x}$ =

Flash Player version 10 or higher is required for this question.
You can get Flash Player free from Adobe's website.

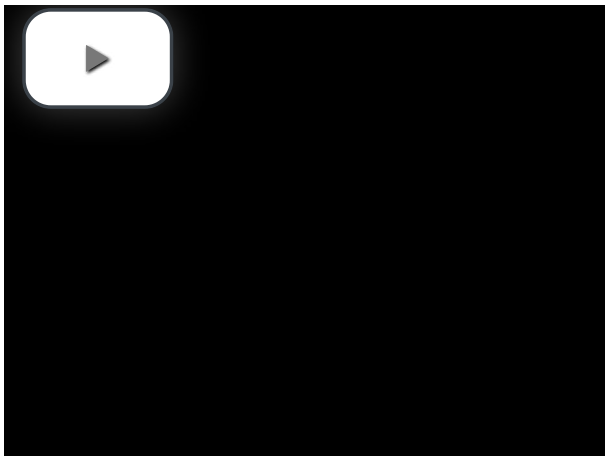
27. Question Details SCalcET8 8.3.501.XP. [3805888]

A 2-ft-high and 7-ft-wide rectangular plate is submerged vertically in water so that the top is 1 ft below the surface. Express the hydrostatic force against one side of the plate as an integral and evaluate it. (Recall that the weight density of water is 62.5 lb/ft^3.)

$\int_1^{\square} \left(\quad \right) dx \approx$ lb

28. Question Details SCalcET8 8.3.VE.001. [3806261]

Watch the video below then answer the question.



The center of mass is at $\left(\frac{M_y}{m}, \frac{M_x}{m}\right)$, where m is the mass and M_y and M_x are moments of mass with respect to the y and x axis respectively.

- True
- False

Assignment Details

Name (AID): **Chap 8 HW -- Further Application (11708643)**
Submissions Allowed: **15**
Category: **Homework**
Code:
Locked: **Yes**
Author: **Bird, Brian (** brian.bird@gccaz.edu **)**
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