

Feedback — Chapter 4 Quiz: Applications

Thank you. Your submission for this exam was received.

You submitted this exam on **Wed 20 Mar 2013 11:49 PM EDT -0400**. You got a score of **8.00** out of **10.00**.

Question 1

Compute the expectation \mathbb{E} of the probability density function

$$\rho(x) = \frac{3}{2} \sqrt{x}$$

on $0 \leq x \leq 1$.

Your Answer	Score	Explanation
<input type="radio"/> $\frac{2}{3}$		
<input checked="" type="radio"/> $\frac{3}{5}$	✓ 1.00	
<input type="radio"/> $\frac{5}{3}$		
<input type="radio"/> $\frac{1}{2}$		
<input type="radio"/> $\frac{4}{15}$		
<input type="radio"/> $\frac{2}{5}$		
Total	1.00 / 1.00	

Question 2

An aerosol spray releases spherical droplets whose radii are distributed randomly by a uniform distribution between 1 and 3 micrometers. What is the average *volume* of such an aerosol droplet (in units of cubic micrometers)?

Your Answer	Score	Explanation
<input type="radio"/> $\frac{26}{3} \pi$		
<input type="radio"/> $\frac{40}{3} \pi$		
<input type="radio"/> $\frac{80}{9} \pi$		
<input type="radio"/> 9π		
<input checked="" type="radio"/> $\frac{80}{3} \pi$	✗ 0.00	
<input type="radio"/> $\frac{13}{3} \pi$		
Total	0.00 / 1.00	

Question 3

Find the y -coordinate of the center of mass of a thin sheet of metal of constant density of a shape bounded by the x -axis and the parabola

$$y = 1 - \frac{x^2}{25}$$

Your Answer	Score	Explanation
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☐ $\frac{4}{5}$

☒ $\frac{2}{5}$



1.00

☐ $\frac{8}{5}$

☐ $\frac{8}{3}$

☐ $\frac{4}{3}$

☐ 0

Total

1.00 / 1.00

Question 4

A drink of (weight-)density $1/16$ pound-per-cubic-inch fills a (martini) glass in the shape of an upside-down cone whose height is 4 inches, and whose top is a circular disc of radius 2 inches. How much work is required to suck the liquid up a straw to a height 6 inches from the bottom tip of the cone?

Your Answer

Score

Explanation

☐ $\frac{4\pi}{3}$

☒ π



1.00

☐ $\frac{\pi}{3}$

☐ 4π

☐ 2π

☐ $\frac{27\pi}{16}$

Total

1.00 / 1.00

Question 5

Consider a solid ball of radius R and mass M distributed with uniform density. What is the moment of inertia of this ball about an axis which passes through the center?

Your Answer	Score	Explanation
<input type="radio"/> $\frac{2}{3} MR^2$		
<input checked="" type="radio"/> $\frac{2}{5} MR^2$	✓ 1.00	
<input type="radio"/> $\frac{1}{5} MR^2$		
<input type="radio"/> $\frac{3}{2} MR^2$		
<input type="radio"/> $\frac{3}{4} MR^2$		
<input type="radio"/> $\frac{1}{3} MR^2$		
Total	1.00 / 1.00	

Question 6

Find the volume of the body obtained by rotating about the x -axis the region between the *cuspidal cubic* $x^2 = y^3$, the x -axis and the line $x = 1$.

Your Answer	Score	Explanation
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☐ $\frac{\pi}{7}$

☒ $\frac{3\pi}{7}$



1.00

☐ $\frac{3\pi}{5}$

☐ $\frac{\pi}{5}$

☐ $\frac{9\pi}{7}$

☐ $\frac{\pi}{8}$

Total

1.00 / 1.00

Question 7

What is the area in the plane enclosed by the graph of the function

$r(\theta) = \cos \theta + \sin \theta$ (**defined using polar coordinates**) for θ between 0 and $3\pi/4$?

Your Answer

Score

Explanation

☐ $\frac{3\pi}{4} + \frac{1}{2}$

☒ $\frac{3\pi}{8} + \frac{1}{4}$



1.00

☐ $1 + \sqrt{2}$

☐ $\frac{1 + \sqrt{2}}{2}$

☐ $\frac{1}{4}$

☐ π

Total

1.00 / 1.00

Question 8

Which one of the following integrals computes the surface area of the surface obtained by rotating a quarter-circle

$$x^2 + y^2 = 4, \quad x, y \geq 0$$

about the line $x = -1$?

Hint 1: slice into horizontal strips.

Hint 2: don't integrate this! (though you could if you had to...)

Your Answer	Score	Explanation
<input type="radio"/> $\int_{x=0}^2 \sqrt{\frac{4}{4-x^2}} dx$		
<input type="radio"/> $\int_{x=0}^2 2\pi(x+1)\sqrt{\frac{4}{4-x^2}} dx$		
<input type="radio"/> $\int_{x=-1}^2 2\pi x \sqrt{\frac{4}{4-x^2}} dx$		
<input type="radio"/> $\int_{x=0}^2 2\pi(x+1)\sqrt{1+4x^2} dx$		
<input type="radio"/> $\int_{x=-1}^1 2\pi x \sqrt{\frac{4}{4-x^2}} dx$		
<input checked="" type="radio"/> $\int_{x=0}^2 2\pi x \sqrt{\frac{4}{4-x^2}} dx$	✗ 0.00	
Total	0.00 / 1.00	

Question 9

Find the arc length of the curve $y = \frac{x^2}{4} - \frac{\ln x}{2}$ between $x = 1$ and $x = e$.

Hint: if you compute the length element correctly, a miraculous simplification should occur, making the integral doable.

Your Answer	Score	Explanation
<input type="radio"/> $\frac{e^2 - 2}{4}$		
<input checked="" type="radio"/> $\frac{e^2 + 1}{4}$	✓ 1.00	
<input type="radio"/> $\frac{e^2 + 2}{4}$		
<input type="radio"/> $\frac{2\pi e}{3}$		
<input type="radio"/> $\frac{e^2}{4}$		
<input type="radio"/> $\frac{e^2 - 1}{4}$		
Total	1.00 / 1.00	

Question 10

Compute the present value PV of the following income stream $I(t)$, assuming an continuously-compounding interest rate of 5 per cent ($r = 0.05$). The income stream is the following: for the first 10 years, you get nothing: $I(t) = 0$ for $0 \leq t \leq 10$.

Then, you get income at a constant rate of ten-thousand (10,000) dollars-per-year in perpetuity (that is, you get money at that rate for all future time).

Your Answer	Score	Explanation
<input type="radio"/> $PV = 200,000$		
<input checked="" type="radio"/> $PV = \frac{200,000}{\sqrt{e}}$	✓ 1.00	
<input type="radio"/> $PV = 100,000e^2$		
<input type="radio"/> $PV = \frac{200,000}{e}$		
<input type="radio"/> $PV = 5,000e$		
<input type="radio"/> $PV = \frac{500}{\sqrt{e}}$		
Total	1.00 / 1.00	