

# Math 162Q: Quest Calculus II

## Sample Midterm-I

!!!(Midterm-I date: October 20, 2009; Midterm-I Room: B&L 106)!!!

NAME (please print legibly): \_\_\_\_\_

Your University ID Number: \_\_\_\_\_

- The use of calculators, cell phones, iPods and other electronic devices at this exam is strictly forbidden.
- Show your work and justify your answers. You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.
- Put your answers in the spaces provided.
- You are responsible for checking that this exam has all 7 pages.

QUESTION	VALUE	SCORE
1	18	
2	14	
3	16	
4	16	
5	18	
6	18	
TOTAL	100	

1. (18 pts) Evaluate the following integrals.

a)  $\int x^3 \sin(x^4 + 7) dx$

Answer

b)  $\int_e^{e^4} \frac{dx}{x\sqrt{\ln x}}$

Answer

2. (14 pts) Let  $R$  be the region enclosed by the parabola  $y = 2 - x^2$  and the line  $y = 2x - 6$ .

a) Sketch the region  $R$  in the  $xy$ -plane.

b) Find the  $x$ -coordinates of the points where the parabola and the line intersect each other.

Answer

$x =$	$x =$
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c) Write a definite integral expressing the area  $A$  of the region  $R$ .

(Do not compute the integral!)

Answer

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**3. (16 pts)** Write a definite integral expressing the volume  $V$  of the solid obtained by the rotating the described region  $R$  about the specified line.

**(Do not compute the integrals!)**

a)  $R$  is bounded by  $y = x^2$  and  $y = 3x$ , the rotation is about the line  $y = -1$ .

**(Use the washer method.)**

Answer

b)  $R$  is bounded by  $y = 49x - 7x^2$  and  $y = 0$ , the rotation is about the line  $x = 0$ .

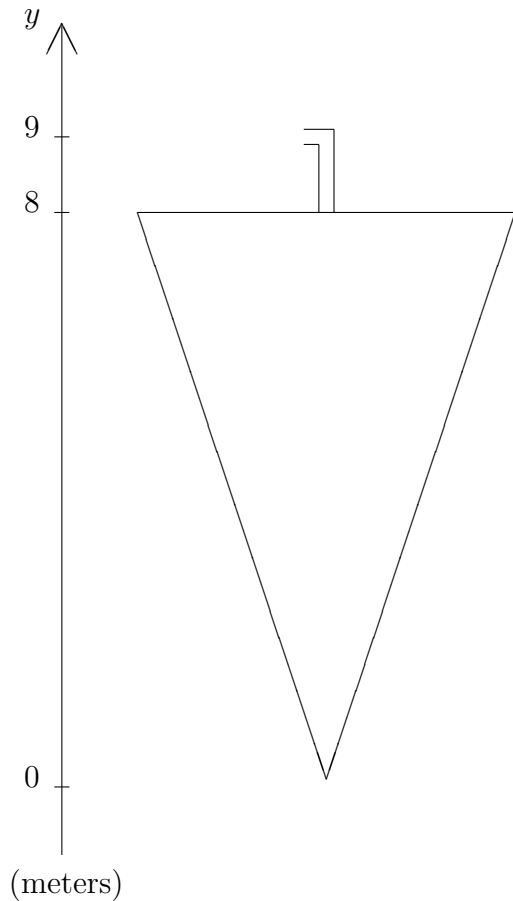
**(Use the shell method.)**

Answer

4. (16 pts) A tank has the shape of an inverted circular cone with height 8 m and top radius 4 m. It is filled with water to a height of 5 m. A spout with height 1 m is attached to the top of the tank. The front view of the tank and the spout are given in the figure below where a  $y$ -coordinate is also fixed. **Write** a definite integral expressing the work required to empty the tank by pumping all of the water out of the spout. (**Use the given  $y$ -coordinate in your computation, and do not compute the integral!**)

You will need the following constants:

- The density of the water is  $1000 \text{ kg/m}^3$ .
- The gravitational acceleration is  $g = 9.8 \text{ N/kg}$ .



Answer

5. (18 pts) Evaluate the following integrals.

a)  $\int_0^{\pi/4} x \sin(4x) dx$

Answer

b)  $\int \cos^3(x) \sin^4(x) dx$

Answer

6. (18 pts) Evaluate the following integrals.

a)  $\int \frac{1}{x^2\sqrt{x^2+9}} dx$

Answer

b)  $\int_0^1 \frac{x-1}{x^2+3x+2} dx$

Answer