MATH 152, SPRING 2012
COMMON EXAM I - VERSION A

Last Name: ______________________________ **First Name**: ______________________________

Signature: ______________________________ **Section No**: ______________

PART I: Multiple Choice (4 pts each)

1. The region bounded by $y = 2x - x^2$ and $y = 0$ is revolved around the y-axis. Find the volume.

   (a) $\dfrac{16\pi}{15}$

   (b) $\dfrac{8\pi}{3}$

   (c) $\dfrac{8\pi}{15}$

   (d) $\dfrac{4\pi}{3}$

   (e) $\dfrac{4\pi}{15}$

2. $\displaystyle\int_0^{\pi/2} \sin^3 x \cos^4 x \, dx =$

   (a) $-\dfrac{2}{35}$

   (b) $\dfrac{1}{4}$

   (c) 0

   (d) $\dfrac{2}{35}$

   (e) $\dfrac{1}{12}$

3. Find the average value of $f(x) = \dfrac{x}{\sqrt{x+1}}$ on the interval $[0, 3]$.

   (a) $\dfrac{8}{9}$

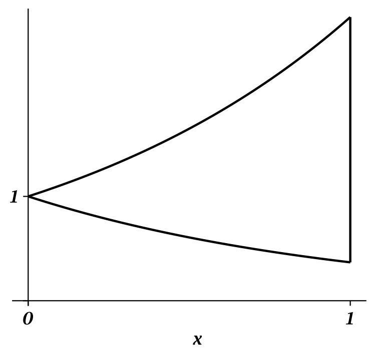
   (b) $\dfrac{8}{3}$

   (c) $\dfrac{14}{9}$

   (d) $\dfrac{27}{32}$

   (e) $\dfrac{1}{288}$

4. Find the area bounded by $y = e^x$, $y = e^{-x}$, $x = 0$, $x = 1$.



(a) $e - \frac{1}{e}$

(b) $e - 2$

(c) $e + 2$

(d) $e + \frac{1}{e}$

(e) $-2 + e + \frac{1}{e}$

5. $\int_1^e x \ln x \, dx =$

(a) $\frac{1}{4}e^2$

(b) $\frac{1}{4} - \frac{1}{4}e^2$

(c) $\frac{1}{4} + \frac{1}{4}e^2$

(d) $-\frac{1}{4} + \frac{1}{2}e^2$

(e) $\frac{1}{6} + \frac{1}{2}e^2 - \frac{1}{6}e^3$

6. A spring has a natural length of 2 m. If a force of 12 N is required to hold the spring to a length of 4 m, find the work done to stretch the spring from 3 m to 6 m.

(a) 81 J

(b) 45 J

(c) 64 J

(d) 27 J

(e) 18 J

7. The region bounded by $y = x^2$ and $y = 4$ is revolved around the x-axis. Find the volume.

(a) $\dfrac{128\pi}{5}$

(b) $\dfrac{704\pi}{5}$

(c) $\dfrac{256\pi}{5}$

(d) $\dfrac{88\pi}{3}$

(e) $\dfrac{128\pi}{3}$

8. $\dfrac{d}{dx}\displaystyle\int_0^{x^2} e^{-t^2}\,dt =$

(a) $2xe^{-x^2}$

(b) e^{-x^4}

(c) $2xe^{-x^4}$

(d) $2xe^{x^4}$

(e) $22xe^{-x^2}$

9. $\displaystyle\int_0^{\pi/4} (\sec^2 x)e^{\tan x}\,dx =$

(a) $e^{\sqrt{2}/2} - 1$

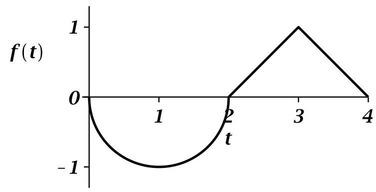
(b) $e^{1/2} - 1$

(c) $e^{\sqrt{2}} - 1$

(d) $e - 1$

(e) $1 - e$

10. Given that $g(x) = \int_0^x f(t)\,dt$, where the graph of $f(t)$ is provided below, evaluate $g(4)$. Note that the graph of $f(t)$ is a piece-wise defined function consisting of a semi-circle and lines.

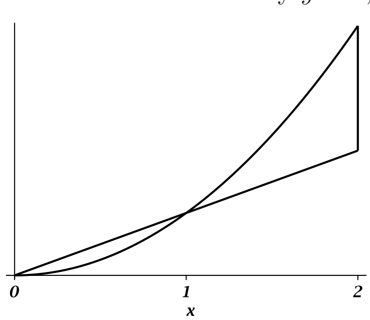


(a) $1 - \dfrac{\pi}{2}$
(b) $1 + \dfrac{\pi}{2}$
(c) $2 - \dfrac{\pi}{2}$
(d) $2 + \dfrac{\pi}{2}$
(e) $1 - \pi$

11. $\displaystyle\int \tan^6 x \sec^4 x\,dx =$

(a) $\dfrac{1}{9}\tan^9 x - \dfrac{1}{7}\tan^7 x + C$
(b) $\dfrac{1}{8}\tan^8 x - \dfrac{1}{6}\tan^6 x + C$
(c) $\left(\dfrac{1}{7}\tan^7 x\right)\left(\dfrac{1}{5}\sec^5 x\right) + C$
(d) $-\dfrac{1}{9}\tan^9 x + \dfrac{1}{7}\tan^7 x + C$
(e) $\dfrac{1}{9}\tan^9 x + \dfrac{1}{7}\tan^7 x + C$

12. Find the area bounded by $y = x$, $y = x^2$, $x = 0$ and $x = 2$.



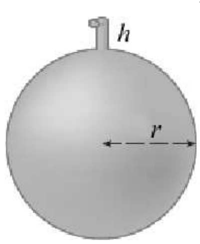
(a) 2
(b) $\dfrac{1}{6}$
(c) $\dfrac{2}{3}$
(d) $\dfrac{5}{6}$
(e) 1

PART II WORK OUT

Directions: Present your solutions in the space provided. *Show all your work* neatly and concisely and *box your final answer*. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.

13. (10 pts) Find the volume of the solid S described here: The base of S is the ellipse $4x^2 + 9y^2 = 36$. Cross sections perpendicular to the y-axis are squares.

14. (10 pts) A tank is in the shape of a sphere of radius $r = 2$ m. The tank is *half full* of water with weight density $\rho g = 9800$ Newtons per cubic meter. Find the work done in pumping the water through a $h = 1$ m long spout located at the top of the tank. Hint: Place the axes so that the origin is located at the center of the tank.



15. Consider the region R bounded by $y = \cos x$, $y = \sin x$, $x = 0$, $x = \dfrac{\pi}{4}$.

a.) (4 pts) Sketch the region R.

b.) (5 pts) Set up the integral that gives the volume obtained by revolving the region R about the x axis using the method of washers. DO NOT EVALUATE THE INTEGRAL.

c.) (6 pts) Set up the integral that gives the volume obtained by revolving the region R about the line $x = \dfrac{\pi}{4}$ using the method of cylindrical shells. DO NOT EVALUATE THE INTEGRAL.

16. Integrate:

a.) (8 pts) $\displaystyle\int \frac{\cos^2(\sqrt{x})}{\sqrt{x}}\,dx$

b.) (9 pts) $\displaystyle\int_0^1 \arctan x\,dx$

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Question	Points Awarded	Points
1-12		48
13		10
14		10
15		15
16		17
		100