MATH 152 Spring 2016
COMMON EXAM I - VERSION A

LAST NAME: _____ FIRST NAME: _____

INSTRUCTOR: _____

SECTION NUMBER: _____

UIN: _____

DIRECTIONS:

1. The use of a calculator, laptop or cell phone is prohibited.
2. TURN OFF cell phones and put them away. If a cell phone is seen during the exam, your exam will be collected and you will receive a zero.
3. In Part 1 (Problems 1-15), mark the correct choice on your ScanTron using a No. 2 pencil. The ScanTron will not be returned, therefore *for your own records, also record your choices on your exam!* Each problem is worth 4 points.
4. In Part 2 (Problems 16-20), present your solutions in the space provided. *Show all your work* neatly and concisely and *clearly indicate 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.
5. Be sure to *write your name, section number and version letter of the exam on the ScanTron form.*

THE AGGIE CODE OF HONOR

"An Aggie does not lie, cheat or steal, or tolerate those who do."

Signature: _____

DO NOT WRITE BELOW!

Question	Points Awarded	Points
1-15		45
16		8
17		8
18		9
19		9
20		21
Total		100

PART I: Multiple Choice. 3 points each.

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

   (a) $1 + \dfrac{1}{e}$

   (b) $e + \dfrac{1}{e} + 2$

   (c) $1 + \dfrac{1}{e} - 2$

   (d) $e + \dfrac{1}{e} - 2$

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

2. Find the average value of $f(x) = \sin^2 x$ on the interval $\left[0, \dfrac{\pi}{8}\right]$.

   (a) $\dfrac{1}{2}\left(\dfrac{\pi}{8} - \dfrac{\sqrt{2}}{4}\right)$

   (b) $\dfrac{4}{\pi}\left(\dfrac{\pi}{8} + \dfrac{\sqrt{2}}{4}\right)$

   (c) $\dfrac{1}{2}\left(\dfrac{\pi}{8} + \dfrac{\sqrt{2}}{4}\right)$

   (d) $\dfrac{4}{\pi}\left(\dfrac{\pi}{8} - \sqrt{2}\right)$

   (e) $\dfrac{4}{\pi}\left(\dfrac{\pi}{8} - \dfrac{\sqrt{2}}{4}\right)$

3. $\displaystyle\int \frac{x}{(x+1)^2}\,dx =$

   (a) $\ln|x+1| + \dfrac{1}{x+1} + C$

   (b) $\ln|x+1| - \dfrac{1}{x+1} + C$

   (c) $\ln|x+1| + \dfrac{1}{3(x+1)^2} + C$

   (d) $\ln|x+1| - \dfrac{1}{3(x+1)^2} + C$

   (e) $\ln|x+1| + \dfrac{3}{(x+1)^2} + C$

4. A spring has a natural length of 2 m. It requires 27 J of work to stretch the spring from 2 m to 5 m. How much work is done in stretching the spring from 3 m to 4 m?

   (a) $\frac{27}{2}$ J

   (b) 21 J

   (c) $\frac{63}{2}$ J

   (d) 6 J

   (e) 9 J

5. Consider the region bounded by $x = 1 - y^2$ and the y axis. Find the volume of the solid obtained by rotating the region about the y axis.

   (a) $\frac{8\pi}{15}$

   (b) $\frac{32\pi}{15}$

   (c) $\frac{16\pi}{15}$

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

   (e) $\frac{8\pi}{5}$

6. $\int \sin^6 x \cos^3 x \, dx =$

   (a) $-\frac{\sin^7 x}{7} + \frac{\sin^9 x}{9} + C$

   (b) $\frac{\sin^7 x}{7} - \frac{\sin^9 x}{9} + C$

   (c) $\frac{\sin^7 x}{7} + \frac{\sin^9 x}{9} + C$

   (d) $\frac{\sin^7 x}{6} - \frac{\sin^9 x}{8} + C$

   (e) $6\sin^5 x - 8\sin^7 x + C$

7. A 10 foot long cable that weighs 60 pounds is hanging from a roof. At the end of this cable, there is a 20 pound box. How much work is done in lifting the entire cable and box to the top of the roof?

   (a) 400 foot pounds

   (b) 1100 foot pounds

   (c) $\frac{2375}{3}$ foot pounds

   (d) 200 foot pounds

   (e) 500 foot pounds

8. $\int_0^1 xe^{5x}\,dx =$

   (a) $\frac{1+4e^5}{25}$

   (b) $\frac{1+6e^5}{25}$

   (c) $\frac{1+5e^5}{25}$

   (d) $\frac{4}{25}e^5$

   (e) $\frac{1+5e^5}{5}$

9. For what value of b is the average value of $f(x) = 6x - 1$ on the interval $[0, b]$ equal to 7?

   (a) $b = 2$

   (b) $b = \frac{16}{3}$

   (c) $b = 8$

   (d) $b = \frac{8}{3}$

   (e) $b = \frac{4}{3}$

10. $\int_0^{\pi/4} \tan^4 x \sec^4 x \, dx =$

(a) $\frac{2}{21}$

(b) $\frac{2}{35}$

(c) $-\frac{2}{35}$

(d) $\frac{10}{21}$

(e) $\frac{12}{35}$

11. $\int_0^2 |x^2 - 1| \, dx =$

(a) 2

(b) $\frac{2}{3}$

(c) 4

(d) $\frac{4}{3}$

(e) 6

12. Find the area bounded by $y = \sqrt{x}$, $y = x$, $x = 0$, $x = 4$.

(a) $\frac{8}{3}$

(b) 3

(c) $\frac{5}{3}$

(d) 4

(e) $\frac{7}{3}$

13. $\int_1^{e^3} \ln x \, dx =$

(a) $\dfrac{1}{e^3} - 1$

(b) $-\dfrac{2}{3}$

(c) $2e^3 - 1$

(d) $\dfrac{2}{3}$

(e) $8 + 16e^3$

14. $\displaystyle\int \frac{\sin(3x)}{\sqrt{1-\cos(3x)}}\, dx =$

(a) $2\sqrt{1-\cos(3x)} + C$

(b) $-2\sqrt{1-\cos(3x)} + C$

(c) $-\dfrac{2}{3}\sqrt{1-\cos(3x)} + C$

(d) $6\sqrt{1-\cos(3x)} + C$

(e) $\dfrac{2}{3}\sqrt{1-\cos(3x)} + C$

15. Consider the region bounded by $y = \sqrt[3]{x}$ and $y = x^2$. Find the volume of the solid obtained by rotating the region about the x axis.

(a) $\dfrac{7\pi}{10}$

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

(c) $\dfrac{8\pi}{5}$

(d) $\dfrac{2\pi}{5}$

(e) $\dfrac{9\pi}{10}$

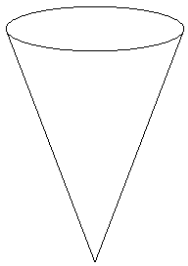
PART II: Work Out

16. (8 pts) Find $\int e^x \cos(2x)\, dx$.

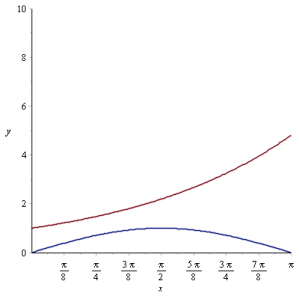
17. (8 pts) Find $\int x^2 \tan^2(x^3)\, dx$.

18. (9 pts) Find the volume of the solid S whose base is the region bounded by $y = 4 - x^2$ and the x axis and whose cross sections perpendicular to the **y axis** are squares.

19. (9 pts) A conical shaped tank is full of water as shown below. If the cone has height 3 m and radius 2 m, find the work done in pumping all of the water out of the cone. Note: the weight density of water is $\rho g = 9800$ Newtons per cubic meter.



20. Consider the region R bounded by $y = e^{x/2}$, $y = \sin x$, $x = 0$ and $x = \pi$.



a.) (7 pts) Find the area of R.

b.) (7 pts) Set up the integral that gives the volume of the solid obtained by rotating R about the **horizontal** line $y = -3$. **Do not evaluate the integral**.

c.) (7 pts) Set up the integral that gives the volume of the solid obtained by rotating R about the **vertical line** $x = \pi$. **Do not evaluate the integral**.