LAST NAME, FIRST NAME (print): _____

INSTRUCTOR: _____ SECTION NUMBER: _____

UIN: _____ SEAT NUMBER: _____

Directions

1. The use of all electronic devices is prohibited.
2. In Part 1 (Problems 1-10), mark the correct choice on your Scantron using a No. 2 pencil. **Record your choices on your exam. Scantrons will not be returned.**
3. In Part 2 (Problems 11-15), 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.
4. Be sure to **write your name, section and version letter of the exam on the Scantron form.**
5. Good Luck!

THE AGGIE CODE OF HONOR

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

Signature: _____

http://xkcd.com

Question	1-10	11	12	13	14	15	TOTAL
Points Awarded							
Points Possible	50	10	10	10	10	10	100

1. Compute $\int_1^2 \ln(x)\,dx$.

   (a) $-\frac{1}{2}$

   (b) $\frac{\ln(2)}{2} - 1$

   (c) $2\ln(2) - 1$

   (d) $2\ln(2) - 3$

   (e) $\frac{\ln 2}{2} - \frac{3}{2}$

2. If $F(x) = \int_0^{\sin(x)} e^{t^2}\,dt$ what is $F'(x)$?

   (a) $e^{\sin^2(x)}$

   (b) $-\sin(x)e^{\sin^2(x)}$

   (c) $\cos(x)e^{\sin^2(x)}$

   (d) $\sin(x)e^{x^2}$

   (e) e^{x^2}

3. Compute $\int_0^1 \frac{3x}{\sqrt[3]{x^2+1}}\,dx$.

   (a) $\frac{9}{4}\sqrt[3]{4} - \frac{9}{4}$

   (b) $\sqrt[3]{4} - 1$

   (c) $\frac{\sqrt[3]{25}}{4}$

   (d) $\frac{9}{4}$

   (e) $\frac{9}{4}\sqrt[3]{25} - \frac{9}{4}\sqrt[3]{4}$

4. Find the average value of $f(x) = \cos^2(x)\sin(2x)$ over the interval $\left[0, \frac{\pi}{2}\right]$.

   (a) $\frac{1}{2}$
   (b) $\frac{1}{\pi}$
   (c) π
   (d) $-\frac{1}{2}$
   (e) $\frac{1}{4\pi}$

5. Find the area between the curves $y = x^3$ and $y = x$ from $x = 0$ to $x = 2$.

   (a) 0
   (b) $\frac{3}{2}$
   (c) 2
   (d) $-\frac{1}{2}$
   (e) $\frac{5}{2}$

6. After an appropriate substitution, the integral $\int_{-1}^{4} \frac{x}{(5+x)^2}\,dx$ is equivalent to which of the following?

   (a) $\int_4^9 \left(5u^{-2} - u^{-1}\right)\,du$
   (b) $\int_2^3 \left(5u^{-2} - u\right)\,du$
   (c) $\int_2^3 \left(u^{-1} - 5u^{-2}\right)\,du$
   (d) $\int_4^9 \left(u^{-1} - 5u^{-2}\right)\,du$
   (e) $\int_{-1}^4 x\,u^{-2}\,du$

7. A 15-Newton weight is suspended vertically at the end of a 30 m long rope. The rope weighs 6 Newtons. How much work (in Newton-m) is required to pull the weight to the top?

   (a) 450

   (b) 180

   (c) 900

   (d) 540

   (e) 360

8. Using **cylindrical shells** which integral gives the volume of the solid formed by rotating the region bounded by $y = \sqrt{x}$ and $y = x^2$ about the line $y = -1$?

   (a) $2\pi \int_0^1 (y-1)(\sqrt{y} - y^2)\, dy$

   (b) $2\pi \int_0^1 (y+1)(\sqrt{y} - y^2)\, dy$

   (c) $\pi \int_0^1 (y^2 - \sqrt{y})^2\, dy$

   (d) $\pi \int_0^1 \left[(x^2-1)^2 - (\sqrt{x}-1)^2\right]\, dx$

   (e) $\pi \int_0^1 \left(x^2 - \sqrt{x}\right)(x+1)\, dx$

9. Compute $\int_0^{\frac{\pi}{4}} x\cos(x)dx$.

(a) $\frac{\sqrt{2}}{2}\left(\frac{\pi}{4}+1\right)-1$

(b) $\frac{\pi\sqrt{2}}{8}$

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

(d) $\frac{\sqrt{2}}{2}\left(\frac{\pi}{4}+1\right)$

(e) 0

(f) $\frac{\pi}{4}+\frac{\sqrt{2}}{2}$

10. Find the volume of the solid formed by rotating the region bounded by $x=0$, $y=\ln(x)$, $y=0$, and $y=2$ about the y-axis.

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

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

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

(d) $\frac{\pi}{2}e^4$

(e) πe^4-1

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.

11. Compute the following integrals:

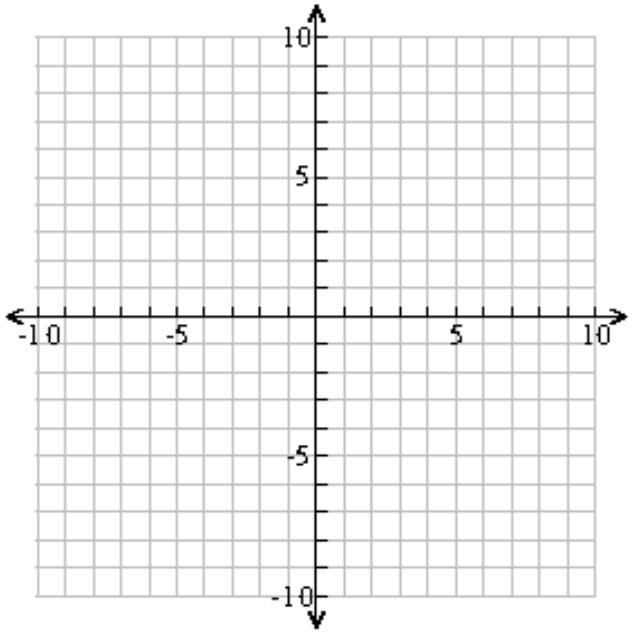
(a) (5 points) $\int x^3 \ln(x)\, dx$

(b) (5 points) $\int \cos^3(x) \sin^2(x)\, dx$

12. (10 points) A cylindrical stock tank has height $h = \frac{2}{3}$ m. The diameter is $d = 1$ m; illustration below. The tank is full of liquid (density $= \rho$ kg/m^3). What is the work required to pump all the liquid out of the top of the stock tank? (Leave your answer in terms of ρ and g the gravitational constant.)

13. (10 points) Find the volume of the solid whose base is the area enclosed by $y = \sin(x)$ and $y = \cos(x)$ from $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$ with cross-sections perpendicular to the x-axis that are squares.

14. (a) (5 points) Sketch a graph of the region bounded by the curve $y = e^{\frac{x}{2}}$; the line through $(1, 0)$ and $(3, e^{3/2})$, which is the tangent line to $y = e^{\frac{x}{2}}$ at $x = 3$; the x-axis, and the y-axis. $e^{1/2} \approx 1.6$, $e \approx 2.7$, and $e^{3/2} \approx 4.5$. Clearly label all points of intersection on the graph.



(b) (5 points) Find the area of the region.

15. (10 points) Compute the indefinite integral

$$\int x^2 \sin(2\pi x)\, dx.$$