

LAST NAME, FIRST NAME (print): \_\_\_\_\_

INSTRUCTOR: \_\_\_\_\_ SECTION NUMBER: \_\_\_\_\_

UIN: \_\_\_\_\_ SEAT NUMBER: \_\_\_\_\_

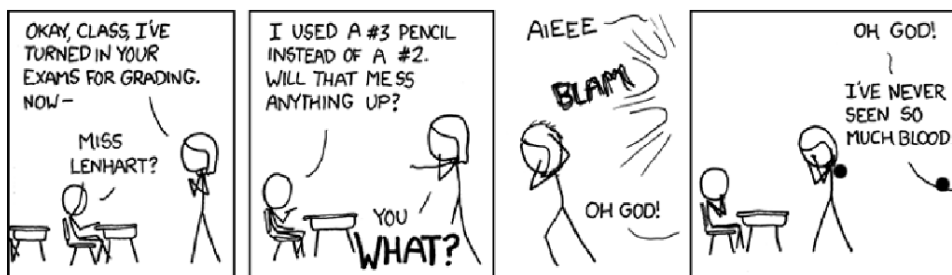
### Directions

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

(a)  $\frac{-1}{4\pi}$

(b)  $\frac{-1}{\pi}$

(c)  $-\pi$

(d)  $\frac{1}{2}$

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

2. A 15-Newton weight is suspended vertically at the end of a 20 m long rope. The rope weighs 4 Newtons. How much work (in Newton-m) is required to pull the weight to the top?

(a) 40

(b) 260

(c) 300

(d) 340

(e) 600

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

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

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

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

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

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

4. Compute  $\int_0^2 \frac{5x}{\sqrt[3]{x^2+1}} dx$ .

(a)  $\sqrt[3]{25} - 1$

(b)  $\frac{\sqrt[3]{(26)^2}}{4}$

(c)  $\frac{15}{4}$

(d)  $\frac{15}{4} \sqrt[3]{(26)^2} - \frac{15}{4} \sqrt[3]{4}$

(e)  $\frac{15}{4} \sqrt[3]{25} - \frac{15}{4}$

5. Compute  $\int_1^3 \ln(x) dx$ .

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

(b)  $3 \ln(3) - 3$

(c)  $\frac{\ln(3)}{3} - 1$

(d)  $\frac{\ln 3}{3} - \frac{1}{3}$

(e)  $-\frac{1}{3}$

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

(a) 0

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

(c) 2

(d)  $-\frac{1}{6}$

(e) 1

7. After an appropriate substitution, the integral  $\int_{-3}^5 \frac{x}{(4+x)^2} dx$  is equivalent to which of the following?

(a)  $\int_1^9 (4u^{-2} - u^{-1}) du$

(b)  $\int_1^9 (u^{-1} - 4u^{-2}) du$

(c)  $\int_1^3 (4u^{-2} - u) du$

(d)  $\int_1^3 (u^{-1} - 4u^{-2}) du$

(e)  $\int_{-3}^5 x u^{-2} du$

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

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

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

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

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

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

(f) 0

9. Using **cylindrical shells** which integral gives the volume of the solid formed by rotating the region bounded by  $y = x^2$  and  $y = \sqrt[3]{x}$  about the line  $y = -1$ ?

(a)  $2\pi \int_0^1 (y - 1)(\sqrt{y} - y^3) dy$

(b)  $\pi \int_0^1 (y^3 - \sqrt{y})^2 dy$

(c)  $2\pi \int_0^1 (y + 1)(\sqrt{y} - y^3) dy$

(d)  $\pi \int_0^1 [(x^2 - 1)^2 - (\sqrt[3]{x} - 1)^2] dx$

(e)  $\pi \int_0^1 (x^2 - \sqrt[3]{x})(x + 1) dx$

10. Find the volume of the solid formed by rotating the region bounded by  $x = 0$ ,  $y = \ln(x)$ ,  $y = 0$ , and  $y = 3$  about the  $y$ -axis.

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

(b)  $\frac{\pi}{2}e^6 - 1$

(c)  $\frac{\pi}{2}e^6$

(d)  $\frac{\pi}{2}(e^6 - 1)$

(e)  $\pi e^6 - 1$

**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. (10 points) Compute the indefinite integral

$$\int x^2 \cos(2\pi x) dx.$$

12. (10 points) Find the volume of the solid whose base is the area enclosed by  $y = \sin(x)$  and  $y = \cos(x)$  from  $\left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$  with cross-sections perpendicular to the  $x$ -axis that are squares.

13. (10 points) A cylindrical stock tank has height  $h = \frac{3}{4}$  m. The diameter is  $d = 1$  m; illustration below. The tank is full of liquid (density =  $\rho$  kg/m<sup>3</sup>). What is the work required to pump all the liquid out of the top of the stock tank? (Leave your answer in terms of  $\rho$  and  $g$  the gravitational constant.)

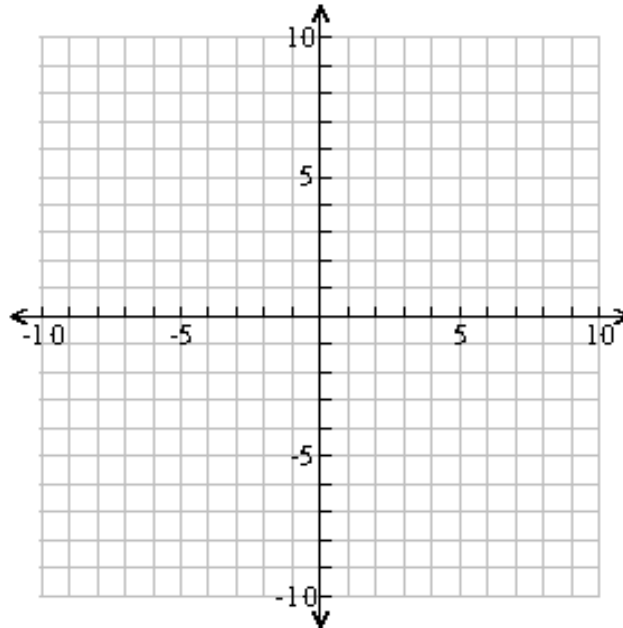


14. Compute the following integrals:

(a) (5 points)  $\int x^4 \ln(x) dx$

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

15. (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.