MA 22400 **EXAM 1** **Form 01**

NAME______________________________INSTRUCTOR______________________________

INSTRUCTIONS

1. Fill in your name and your instructor's name above.
2. You must use a #2 pencil on the scantron answer sheet.
3. Fill in your name, your four digit section number, "01" for the Test/Quiz Number, and your student identification number. Make sure to blacken in the appropriate spaces. If you do not know your section number, ask your instructor. Sign your name.
4. There are 15 questions. Blacken in your choice of the correct answer in the spaces provided on the scantron answer sheet. **Only the scantron answer sheet will be graded. When you have completed the exam, turn in the scantron answer sheet only. You may take the exam booklet with you.**
5. **The exam is self-explanatory. Do not ask your instructor any questions about the exam problems.**
6. **Only one-line calculators (any brand) are allowed. Cell phones and PDA's may not be used as a calculator and must be put away during the exam. NO BOOKS OR PAPERS ARE ALLOWED. Use the back of the test pages for scrap paper.**

VOLUME & SURFACE AREA

Right Circular Cylinder
$V = \pi r^2 h$
$$SA = \begin{cases} 2\pi r^2 + 2\pi r h \\ \pi r^2 + 2\pi r h \end{cases}$$

Sphere
$V = \frac{4}{3}\pi r^3$
$SA = 4\pi r^2$

Right Circular Cone
$V = \frac{1}{3}\pi r^2 h$
$SA = \pi r\sqrt{r^2 + h^2} + \pi r^2$

1. Solve the initial value problem for $y = f(x)$:
$\dfrac{dy}{dx} = 3x^2 - 4x + 1$ where $y = 3$ when $x = -1$:

   A. $y = x^3 - 2x^2 + x + 3$

   B. $y = 3x^3 - 4x^2 + x + 11$

   C. $y = 6x + 9$

   D. $y = x^3 - 2x^2 + x - 13$

   E. $y = x^3 - 2x^2 + x + 7$

2. If $f'(x) = \dfrac{2x+1}{x^2+x+1}$ and $f(0) = 1$, find $f(1)$ correct to two decimal places.

   A. 1.10

   B. 1.48

   C. 0.11

   D. 2.10

   E. 1.00

3. Evaluate $\displaystyle\int_1^4 \left(2 - \frac{1}{\sqrt{x}}\right) dx$.

   A. $-\frac{7}{16}$

   B. $\frac{1}{2}$

   C. $\frac{7}{16}$

   D. 4

   E. 8

4. Which of the following integrals will give the area of the region between the curve $y = x^2 - 3x - 10$ and the x-axis?

   A. $\int_0^5 (x^2 - 3x - 10)dx$

   B. $\int_{-2}^5 (-x^2 + 3x + 10)dx$

   C. $\int_{-2}^0 (-x^2 + 3x + 10)dx$

   D. $\int_{-2}^5 (x^2 - 3x - 10)dx$

   E. $\int_0^5 (-x^2 + 3x + 10)dx$

5. $\displaystyle\int \sqrt{x}(x^2 - 1)\, dx =$

   A. $\frac{2}{5}x^{5/2} - \frac{1}{2}x^{1/2} + C$

   B. $\frac{2}{3}x^{3/2}(\frac{1}{3}x^3 - x) + C$

   C. $\frac{2}{7}x^{7/2} - \frac{2}{3}x^{3/2} + C$

   D. $\frac{1}{2}x^2 - \frac{2}{3}x^{3/2} + C$

   E. $\dfrac{5}{2}x^{3/2} - \dfrac{1}{2x^{1/2}} + C$

6. $f(x)$ and $g(x)$ are functions that are continuous on the interval $-5 \leq x \leq 4$ and satisfy:

$$\int_{-5}^{4} f(x)dx = 3,\ \int_{-5}^{4} g(x)dx = -2,\ \int_{-1}^{4} f(x)dx = 1,\ \int_{-1}^{4} g(x)dx = 6.$$

Use this information along with rules of definite integrals to evaluate:

$$\int_{-1}^{4} [3f(x) - 5g(x)]dx.$$

A. 5

B. 19

C. -21

D. -27

E. -11

7. The slope $f'(x)$ at each point (x, y) on the curve $y = f(x)$ is $f'(x) = x\sqrt{x^2 - 1}$ and $(1, 4)$ is a point on the curve $y = f(x)$. Find $f(x)$:

A. $f(x) = (x^2 - 1)^{3/2} + 4$

B. $f(x) = \frac{1}{3}(x^2 - 1)^{3/2} + 4$

C. $f(x) = \frac{x^2}{3}(x^2 - 1)^{3/2} + 4$

D. $f(x) = \frac{3}{4}(x^2 - 1)^{3/2} + 4$

E. $f(x) = \frac{2}{3}(x^2 - 1)^{3/2} + 4$

8. Purduecoin, a digital currency, is mined at the rate $P'(t) = \frac{5}{t+1} - e^{-3}$ million coins per year, t years after it was created. How many million coins will be mined during the first 2 years? Round your answer to two decimal places.

   A. 5.16 million

   B. 4.44 million

   C. 5.83 million

   D. 5.49 million

   E. 5.39 million

9. Find the area of the region bounded by the graphs of the equations:

$$y = 1 + e^{x/2}, \qquad y = 0, \qquad x = 0, \qquad x = a$$

   where a is a constant with $a > 0$.

   A. $a + \frac{1}{2}(e^{a/2} + 1)$

   B. $a - \frac{1}{2}(e^{a/2} + 1)$

   C. $a + 2(e^{a/2} - 1)$

   D. $a + \frac{1}{2}(e^{a/2} - 1)$

   E. $a - 2(e^{a/2} - 1)$

10. The population of a town is increasing at a rate of $5 + 4t^{\frac{3}{4}}$ people per month, where t is months from now. If the current population is 2,500, what will it be 9 months from now?

A) 2645

B) 2652

C) 4687

D) 3647

E) 2601

11. Compute the integral:

$$\int (5x^2 + 10)e^{x^3+6x}dx.$$

A. $\dfrac{3}{5}e^{x^3+6x} + C$

B. $\dfrac{5}{3}e^{x^3+6x} + C$

C. $\dfrac{5}{3}e^{\frac{1}{4}x^4+3x^2} + C$

D. $(\dfrac{1}{4}x^4 + 3x^2)e^{x^3+6x} + C$

E. $(3x^2 + 6)e^{x^3+6x} + C$

12. Find the area of the region bounded by the curve $y = x^3 - 6x^2$ and the x-axis.

A. 30

B. 36

C. 108

D. 216

E. 324

13. Compute the integral: $\int \frac{1}{4x(\ln x)^5} dx$.

A. $\frac{-1}{(\ln x)^4} + C$

B. $\frac{-3}{2(\ln x)^6} + C$

C. $\frac{-1}{16(\ln x)^4} + C$

D. $\frac{-1}{4(\ln x)^4} + C$

E. $\frac{-3}{4(\ln x)^4} + C$

14. The marginal revenue from the sale of q units is given by $R'(q) = 20 + 4.5qe^{-0.1q^2}$ dollars per unit. Assuming there is no revenue for selling zero units, what is the revenue from selling 100 units?

A) 1977.50 dollars

B) 22.50 dollars

C) 2000.00 dollars

D) 42.50 dollars

E) 2022.50 dollars

15. A barrel is filled with water at 6am one morning, but due to a small crack, the water leaks out of the barrel at a rate of

$$Q'(t) = \frac{2t^2 + 1}{t + 1}$$

ml per hour, where t is the number of hours after 6am. How much water, in ml, leaks out of the barrel between 7am and 9am?

A. $3\ln(2) + 4$

B. $13/4$

C. $76/45$

D. $6\ln(2)$

E. $3\ln(9/7) + 24$