

- A scantron is provided with this test. Fill in your ID information on the scantron now. Do not fold, staple or tear, etc., the scantron.
- This test consists of multiple-choice problems. Fill in the answers to the problems on the scantron. Return only the scantron. You may keep the test.
- Depending on your solution methods your answers may appear in a different form from the ones provided on the test. You are expected to be able to provide the appropriate manipulations to identify the correct answer.
- You may use one 8.5×11 inch note sheet prepared in advance. Note sheets may not be shared. If you do not bring a note sheet you will have to do without any help notes. You may not use any books, notebooks, additional note sheets nor note cards.
- You may use a simple scientific calculator or a modest graphics calculator on this test and you are expected to have one available. An overly elaborate calculator, laptop, handheld or notebook computer, or any device capable of extensive symbolic manipulation (other than your own brain) will not be allowed. Calculators and other equipment may not be shared.
- During the test be sure to check the board occasionally for corrections. Note $\log(x)$, $\ln(x)$ or $\log_e(x)$ means the natural logarithm of x . I will use $\log_{10}(x)$ to denote the logarithm base 10 of x .
- There are 8 multiple-choice problems worth 12 points each. The total number of points is 96 points.

Problem 1. Find an equation of the tangent line to the graph of $y = 6 \sin(x)$ at $x = \pi/3$.

- A.) $y = 6x + 3\sqrt{3} - \pi$ B.) $y = 3x\sqrt{3} + \pi\sqrt{3} + 3$
C.) $y = 3x + 3\sqrt{3} - \pi$ D.) $y = 3x - 3\sqrt{3} - 2\pi$ E.) None of the foregoing.

←Mark your answer here and on the scantron.

(Problem 1).

Problem 2. A piece of wire of length 60 inches is cut into two pieces. One piece is folded into a square and the other into an equilateral triangle. Find the maximum of the area of the square plus the area of the triangle. Choose the closest number from the list below.

- A.) 225 B.) 173
C.) 112 D.) 98 E.) 82

←Mark your answer here and on the scantron.

(Problem 2).

Problem 3. A piece of wire of length 60 inches is cut into two pieces. One piece is folded into a square and the other into an equilateral triangle. Find the minimum of the area of the square plus the area of the triangle. Choose the closest number from the list below.

- A.) 225 B.) 173
C.) 112 D.) 98 E.) 82

←Mark your answer here and on the scantron.

(Problem 3).

Problem 4. A rectangular box of height h inches with a square bottom of side length s inches has volume $V = hs^2 \text{ in}^3$. The box is constructed with a bottom and 4 sides of course, but no top. If the surface area of the sides and bottom is 12 in^2 total find the maximum possible volume.

- A.) 4 in^3 B.) 6 in^3
C.) 8 in^3 D.) 12 in^3 E.) None of the foregoing.

←Mark your answer here and on the scantron.

(Problem 4).

Problem 5. A rectangular box of height h inches with a square bottom of side length s inches has volume 27 in^3 . The box is constructed with a bottom and 4 sides of course, but no top. Find the minimum possible surface area.

- A.) 27 in^2 B.) 54 in^2
C.) $27 \times 2^{-2/3} \text{ in}^2$ D.) $27 \times 2^{-1/3} \text{ in}^2$ E.) None of the foregoing.

←Mark your answer here and on the scantron.

(Problem 5).

Problem 6. Compute

$$\lim_{x \rightarrow 0} \frac{\tan(x)}{e^x - 1}$$

- A.) 0 B.) 1
C.) 2 D.) 3 E.) None of the foregoing.

←Mark your answer here and on the scantron.

(Problem 6).

Problem 7. Compute

$$\lim_{x \rightarrow 0} \frac{x(\cos(x) - 1)}{x - \sin(x)}.$$

- A.) 1 B.) 2
C.) -1 D.) -2 E.) None of the foregoing.

←Mark your answer here and on the scantron.

(Problem 7).

Problem 8. If

$$x^2y + xy^2 = 2$$

compute (implicitly) $\frac{dy}{dx}$ when $x = 1$ and $y = 1$. That is, find the slope of the tangent to the curve $x^2y + xy^2 = 2$ at the point $(1, 1)$,

- A.)** 1 **B.)** 2
C.) -1 **D.)** -2 **E.)** None of the foregoing.

←Mark your answer here and on the scantron.

(Problem 8).

Use the backs of the test pages for scratch work.