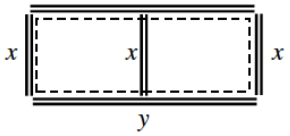
Calculus

Name: Date:

3F Exercises

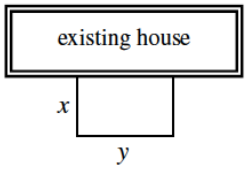
Optimization Problems

1. A rectangular playground is to be fenced off and divided into two equal regions by another fence parallel to one side of the playground. Six hundred feet of fencing is to be used. Find the dimensions of the playground that will enclose the greatest total area?



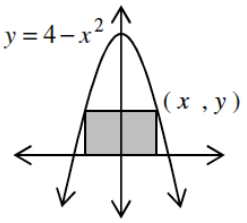
(A) 125 ft by 112.5 ft
(B) 150 ft by 75 ft
(C) 50 ft by 225 ft
(D) 100 ft by 150 ft
(E) 75 ft by 187.5 ft

2. A contractor is building an additional room to an existing house that is 800 ft². Therefore, only three walls need to be built. What dimensions will require the least amount of building materials?



(A) 30 ft by 80/3 ft
(B) 25 ft by 32 ft
(C) 20 ft by 40 ft
(D) 16 ft by 50 ft
(E) 24 ft by 100/3 ft

3. Find the largest possible area for a rectangle with its base on the x-axis and upper vertices on the curve $y = 4 - x^2$.

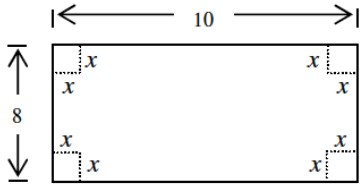


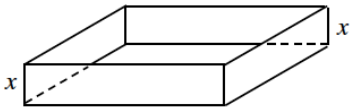
Hint: The base of the rectangle is not x. The base is $2x$.

(A) $24\sqrt{3}$
(B) $32\sqrt{3}$
(C) $16\sqrt{3}$
(D) $\frac{32\sqrt{3}}{9}$
(E) $\frac{16\sqrt{3}}{9}$

4. Squares of equal size are cut off the corners of an 8 x 10 piece of cardboard. The sides are then turned up to form an open box. What is the largest possible volume of the box?
[Note: Use calculator for calculations only.]

(A) 1.472
(B) 1.5
(C) 23.986
(D) 52.50
(E) 52.514



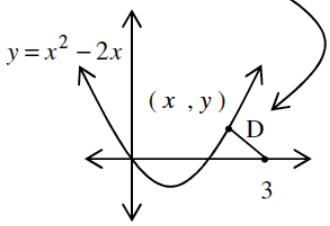


Folded box with open top

5. Find the shortest distance from (3 , 0) to a point on the curve $y = x^2 - 2x$. [Note: Graphing calculator needed.]

(A) 0.908
(B) 1.0
(C) 2.165
(D) 2.20
(E) 3.0

Hint: Distance $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

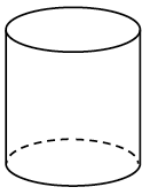


6. You are to make a one quart oil can shaped like a right circular cylinder. What dimensions (radius and height) will use the least material? [Note: Use calculator for calculations only.]

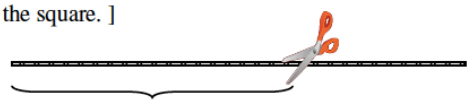
$V = \pi r^2 h$ $SA = 2\pi r^2 + 2\pi r h$

$1\,\text{quart} \approx 57.75\,\text{in}^3$

(A) $r \approx 1.048\,\text{in}$, $h \approx 2.096\,\text{in}$
(B) $r \approx 4.190\,\text{in}$, $h \approx 8.380\,\text{in}$
(C) $r \approx 3.143\,\text{in}$, $h \approx 6.286\,\text{in}$
(D) $r \approx 1.397\,\text{in}$, $h \approx 2.794\,\text{in}$
(E) $r \approx 2.095\,\text{in}$, $h \approx 4.190\,\text{in}$



7. You want to make a square and a circle by cutting a 1-yard long string into two pieces. How many inches from one end would you cut the string that would result in the least combined area?
[Note: The choices are the lengths, in inches, from one side of the string that makes the square.]



This side makes the square.

(A) $\frac{144}{\pi+4}$ in

(B) $\frac{144}{\pi+2}$ in

(C) $\frac{72}{\pi+1}$ in

(D) $\frac{72}{\pi+2}$ in

(E) $\frac{72}{\pi+4}$ in

8. The total cost to produce q goods is given by the equation $C(q)=.008q^3-.5q^2+12q+25$.

a) What is the fixed cost? [Note: Fixed cost is the "Starting Cost," that is, the cost before you sell any goods.]

b) If profit is measured by "Revenue minus Cost," then find the maximum profit if each item is sold at a price of $7.99. [Note: Use calculator for calculations only.]

ANSWERS:
1) D 3) D 5) A 7) A
2) C 4) E 6) E 8a) $25; $105.92