Calculus Worksheet – Max./Min. Problems

(1) A man has 1200 feet of fence with which to enclose a rectangular area. What should the dimensions be to enclose the largest possible area?

(2) Suppose the man in the previous problem uses a building in place of one of the sides of the rectangle. What should the dimensions be to enclose the largest possible area?

(3) Find the area of the largest rectangle if its lower base is on the x-axis, and its upper vertices are on the graph of the parabola $y = 27 - x^2$.

(4) A line, which passes through the point (3 , 4) intersects the coordinate axes in different points forming a right triangle. Find the area of the smallest triangle.

(5) An open box, without a top is to be made by cutting congruent squares from each corner of a rectangular sheet of metal, which measures 5 inches by 8 inches, and folding up the sides. Find the volume of the box, which has the greatest volume.

(6) The sum of two nonnegative numbers is 4. Find the numbers if the sum of the square of one number and the cube of the other number is to be a: **(a)** maximum **(b)** minimum.

(7) A printed page has 1-inch margins at the top and bottom, and $\frac{3}{4}$ inch margins on each side. The area of the printed portion of the page is 48 square inches. Find the dimensions of the page, which has the smallest possible area.

(8) Let y = f(x) be the function whose derivative is $f'(x) = x(x-2)^2(x-4)^3(x-6)^4(x-8)^5$. Find the x-coordinates of all maximum and minimum points.

(9) Determine the values of the constants α and β so that the function $f(x) = x^3 + \alpha x^2 + \beta x + \delta$ may have a relative maximum at x = –3, and a relative minimum at x = 1.

(10) A cylindrical can has a volume of 54π cubic inches. Find the dimensions of the can, which has the smallest total surface area.

(11) Find the coordinates of the point on the graph of $y = 5 - x^2$ which is nearest to the point (6 , 2)

(12) Find the volume of the largest right circular cylinder, which may be inscribed inside a right circular cone if the radius of the base of the cone is 9 inches, and the height of the cone is 12 inches.

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Answers

(1) 300′ by 300′

(2) 300′ by 600′

(3) 108

(4) 24

(5) 18 in^3

(6) **(a)** 0 & 4 **(b)** $\frac{4}{3}$ & $\frac{8}{3}$

(7) $7\frac{1}{2}$ in. by 10 in.

(8) Max at x = 4 , min at x = 0 and x = 8

(9) $\alpha = 3$, $\beta = -9$

(10) r = 3 in. , h = 6 in.

(11) (2 , 1)

(12) 144π in^3