Math 1431

Section 16679

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10/29/19

Office Hours: Tuesdays & Thursdays 11:45-12:45
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Questions?

Section 4.4 - Inverse Trigonometric Functions

Formulas (u is a function of x):

$$\frac{d}{dx}[\arcsin(u)] = \frac{u'}{\sqrt{1-u^2}}$$

$$\frac{d}{dx}[\arctan(u)] = \frac{u'}{1+u^2}$$

$$\frac{d}{dx}[\text{arcsec}(u)] = \frac{u'}{|u|\sqrt{u^2-1}}$$

Differentiate $y = \sin^{-1}\sqrt{x^2+2}$

Popper 16

1. Find $f'(1)$ given that $f(x) = \arctan(2^x)$.

Popper 16

2. Compute $\lim_{x \to \infty} \arctan(x)$.

Section 5.1 - Optimization

Optimization problems (to maximize or minimize):

1. Draw a picture, label it.
2. Determine the primary function (what is to be a max/min)
3. Use a secondary formula if necessary to get the primary function in terms of one variable.
4. Determine a feasible domain.
5. Find the max/min.
6. SHOW that the answer is a max/min using the First or Second Derivative test.

To maximize/minimize a function on a closed bounded interval, we evaluate the function at the endpoints, and then evaluate the function at any critical numbers in the interval.

Examples:

1. Find the dimensions to minimize the perimeter of a rectangular garden whose area is 48 square feet.

Section 5.1 - Optimization

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

3. Square corners are cut from a rectangular piece of tin that is 24 cm by 45 cm. The edges are folded up to form an open box. Find the length of the side of the square corner removed in order to have a box with a maximum volume.

4. Find two numbers whose sum is 10 and the sum of their squares is a minimum.

5. A rectangle sits in the first quadrant with its base on the x-axis and its left side on the y-axis. Its upper right hand corner is on the line passing through the points (0, 4) and (3, 0). What is the largest possible area of this rectangle?

6. Find A and B given the function $y = Ax^{-1/2} + Bx^{1/2}$ has a minimum value of 6 at $x = 9$.

7. Maximize the volume of a box, open at the top, which has a square base and which is composed of 600 square inches of material. Let x represent each dimension of the base and let y represent the height of the box.

8. Find the point(s) on the graph of $y = 4 - x^2$ closest to $(0, 2)$.

9. A closed box, whose length is twice its width, is to have a surface area of 92 cm^2. Find the dimensions of the box when the volume is a maximum.

Popper 16

3. Compute the slope of the normal line to the graph of $f(x) = \ln\left(\arctan\left(e^x\right)\right)$ at $x = 0$.