Math 3

Get out test corrections

Warm-Up

Find all zeros.

1) $f(x) = (2x-1)(x-5)$

$2x-1=0$
$+1 \quad +1$
$\frac{2x}{2} = \frac{1}{2}$

$x-5=0$
$+5 \quad +5$

$x = \frac{1}{2}$
$x = 5$

2) $f(x) = (x-3)(3x+1)(x+1)$

$x-3=0$
$+3 \quad +3$

$3x+1=0$
$-1 \quad -1$
$\frac{3x}{3} = \frac{-1}{3}$

$x+1=0$
$-1 \quad -1$

$x = 3$
$x = -\frac{1}{3}$
$x = -1$

3. Synthetic division

$(x^4 - 10x^2 - 2x + 4) \div (x + 3)$

$$\begin{array}{r|rrrrr} -3 & 1 & 0 & -10 & -2 & 4 \\ & & -3 & 9 & 3 & -3 \\ \hline & 1 & -3 & -1 & 1 & 1 \end{array}$$

$1x^3 - 3x^2 - x + 1 + \left(\frac{1}{x+3}\right)$

4. Multiply

$(7k-3)(k^2-2k+7)$

$\cancel{7k^3} \cancel{-14k^2} \cancel{+49k} \cancel{-3k^2} \cancel{+6k} -21$

$\boxed{7k^3 - 17k^2 + 55k - 21}$

3.6 Notes: Optimization of Volume

- An optimization problem seeks to maximize or minimize a quantity. In this lesson, the quantity that is being optimized is related to volume. For example, you may want to maximize the volume of a box that can be constructed from a given amount of cardboard, or minimize the surface area of a tin can of a given volume.

Solving Optimization Problems

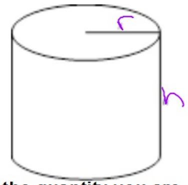
1. Draw a diagram of the situation to help you visualize the problem, then label all known and unknown dimensions.
2. Determine the quantity that you are seeking to maximize or minimize.
3. Write a polynomial function for this quantity in terms of one variable.
4. Determine the domain for the function.
5. Use graphing technology to graph this function and find the maximum or minimum y-value within the domain.
6. Be sure to answer the question being asked.

Guided Practice

Example 1

A manufacturer would like to make a tin can that has a volume of 25 cubic inches and that uses the least amount of tin possible. What is the height and radius of the can?

1. Draw and label a diagram



2. Write a function in terms of one variable for the quantity you are seeking to minimize.

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

$V = 2\pi r^2 h$

$\dfrac{25}{2\pi r^2} = \dfrac{2\pi r^2 h}{2\pi r^2}$

$h = \dfrac{25}{2\pi r^2}$

$\cancel{\pi} \cdot r$

$2\pi r^2 + \cancel{2\pi r}\left(\dfrac{25}{\cancel{2\pi r^2}}\right)$

$2\pi r^2 + \dfrac{25}{r}$

$y = 2\pi x^2 + \dfrac{25}{x}$

3. Determine the domain of the function in the context of the problem.

$\min = 0$

$V = 2\pi r^2 h$

$\dfrac{25}{2\pi(.5)} = \dfrac{2\pi r^2 (.5)}{2\pi(.5)}$

$\sqrt{r^2} = \sqrt{\dfrac{25}{\pi}}$

$r = 2.82$

$0 < r < 3$

4. Graph the function on a graphing calculator, and calculate the minimum value of the function within the given domain.

$x = 1.258$

$y = 29.816$

5. Interpret the results in the context of the problem.

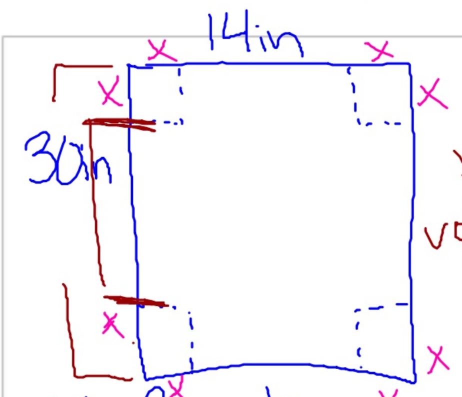
$V = 2\pi r^2 h$

$h = 2.514$

$$\frac{25}{2\pi(1.258)^2} = \frac{2\pi(1.258)^2 h}{2\pi(1.258)^2}$$

minimum tin being used is 29.816 square inches when the radius is 1.258 inches and the height is 2.514 inches

1) A supermarket employee wants to construct an open-top box from a 14 by 30 in piece of cardboard. To do this, the employee plans to cut out squares of equal size from the four corners so the four sides can be bent upwards. What size should the squares be in order to create a box with the largest possible volume?



$x = 3$

volume $= 576\text{ in}^3$

$V = l \cdot w \cdot h$

$V = (30-2x)(14-2x)x$