Math 112

Q's

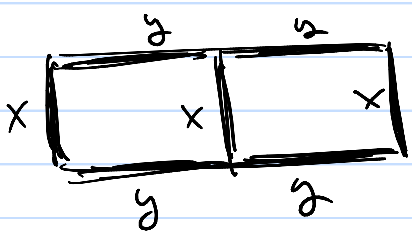
A rancher has **516** feet of fencing to enclose two adjacent rectangular corrals. The wall separating the two corrals consists of a single fence. What dimensions for one of the individual corrals will produce the largest total area?

Your answer is: ______ ft.

Enter length and width of a single corral, separated by commas.

What is the maximum area for the two corrals combined?

Your answer is: ______ square ft.



$$\boxed{516 = 3x + 4y} \rightarrow y = \boxed{\frac{516}{4} - \frac{3x}{4}}$$

Single: $x \cdot y$

total Area: $\boxed{A = 2xy}$

$$A = 2x\left(\frac{516}{4} - \frac{3}{4}x\right) = \underbrace{258}_{b}x \underbrace{- 1.5}_{a}x^2$$

Know max @ vertex

$$x = \frac{-258}{2(-1.5)} = \frac{258}{3}$$

$$x = 86$$

$$\begin{array}{r} 86 \\ 3\,\overline{)\,258} \\ \underline{24} \\ 18 \\ \underline{18} \\ 0 \end{array}$$

A rancher has 516 feet of fencing to enclose two adjacent rectangular corrals. The wall separating the two corrals consists of a single fence. What dimensions for one of the individual corrals will produce the largest total area?

length • width

Your answer is: ______ ft.

Enter length and width of a single corral, separated by commas.

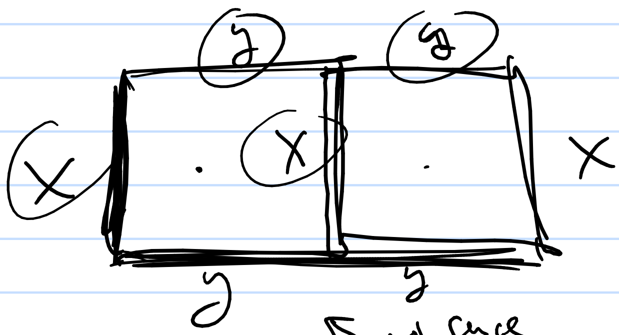
What is the maximum area for the two corrals combined?

Your answer is: ______ square ft.

How to Solve?

(1) Read looking for knowns and unknowns and formulas

Perim (boundry)



(2) Draw Picture

perimeter formula

$P = \boxed{3x + 4y = 516}$

area formula

$\boxed{A = (x)(2y)} = 2xy$

(3) Make a plan to solve it.

max.

$x \cdot 2 \cdot y = 2 \cdot x \cdot y$

---

polynomial

Findy Roots:

$p(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$

$a_n x^n + \dots + a_2 x^2 + a_1 x + a_0 = 0$

factor?

$(x - r_1)(x - r_2) \cdots (x - r_n) = 0$

$\boxed{x = r_1}$ $\boxed{x = r_2}$ $\boxed{x = r_n}$

- zeros
- roots

Factor thⁿ — if $x = c$ is a root/zero then $(x-c)$ was a factor of $p(x)$

$\boxed{\text{thⁿ}}$ for $p(x)$ polynomial of degree ≥ 1 it will have n roots/zeros that are real and/or complex. So we can also say we have at most n real roots.

Find a root? you have found a factor!

tools needed

① division of polynomials

$$\begin{array}{r} 74 \\ 3\overline{)223} \\ \underline{21} \\ 13 \\ \underline{12} \\ 1 \end{array}$$

$$\frac{223}{3} = 74 + \frac{1}{3}$$

$$223 = 3 \cdot 74 + 1$$

$$\begin{array}{r} 3x^2 - 7x + 22 \\ x+3\,\overline{)\,3x^3 + 2x^2 + x - 1} \\ \underline{3x^3 + 9x^2} \\ -7x^2 + x - 1 \\ \underline{-7x^2 - 21x} \\ 22x - 1 \\ \underline{22x + 66} \\ -67 \end{array}$$

remainder

$$3x^3 + 2x^2 + x - 1 = (x+3)(3x^2 - 7x + 22) - 67$$

Note: If you divide $p(x)$ by $x - c$

the remainder is $p(c)$

$$
\begin{array}{r}
2x+3 \\
x-2\overline{\big)\,2x^2-x+1} \\
\underline{2x^2-4x} \\
3x+1 \\
\underline{3x-6} \\
7
\end{array}
$$

$p(x) = 2x^2 - x + 1$

$p(2) = 2(2)^2 - 2 + 1$

$= 7$

Consider: $p(x) = x^4 - x^3 + x^2 + x - 2$

Notice that $p(1) = 0$

$c = 1$

$$
\begin{array}{r}
x^3 \quad\quad +x+2 \\
(x-1)\overline{\big)\,x^4 - x^3 + x^2 + x - 2} \\
\underline{x^4 - x^3} \\
0 \quad x^2 + x - 2 \\
\underline{x^2 - x} \\
2x - 2 \\
\underline{2x - 2} \\
0
\end{array}
$$

synthetic division

$$
\begin{array}{r|rrrr|r}
1 & 1 & -1 & 1 & 1 & -2 \\
 & \text{add} & 1 & 0 & 1 & 2 \\
\hline
\text{mult.} & 1 & 0 & 1 & 2 & 0 \\
 & x^3 & x^2 & x & c & r
\end{array}
$$

$x^3 + x + 2$

$x^4 - x^3 + x^2 + x - 2 = (x-1)(x^3 + x + 2)$

guessing roots and using synthetic division.

1st

$$p(x) = a_n x^n + \dots + a_2 x^2 + a_1 x^1 + a_0$$

if $a_0, a_1, a_2, \dots, a_n$ are all <u>integers</u>

then if you have a rational zero it is..

$$\frac{\pm \text{ factor of } a_0}{\pm \text{ factor of } a_n}$$

1 0 2

ex

$$p(x) = x^7 \overset{?}{+} 2x^3 - x^2 + x - 4$$

$\frac{\text{factors of } 4}{\text{factors of } 1} \to \pm 4, \pm 1, \pm 2$

try: $c = 2$

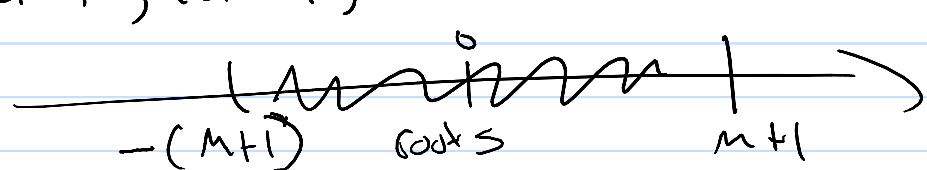
	x^7	x^6	x^5	x^4	x^3	x^2	x	const
2	1	0	0	0	2	-1	1	-4
		2	4	8	16	36	70	142
	1	2	4	8	18	35	71	138

not zero!

Other helps..

① upper / lower range for roots

$\left|\frac{a_0}{a_n}\right|, \left|\frac{a_1}{a_n}\right|, \left|\frac{a_2}{a_n}\right|, \to$ call largest to be M



$$p(x) = 7x^{101} - 3x^2 + 2x - 1 + 14$$

$$\frac{3}{7} \qquad \frac{2}{7} \qquad \frac{1}{7} \qquad \frac{14}{7} = 2$$