03-12-25 MTH 161-C06N

Review for exam 2
Exam 2
Thursday, 03/13/25 (changed from Wednesday)
1.6-1.7,2.1 -2.4

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3 Polynomial Functions

3.1 Graphs of Polynomials
  3.1.1 Exercises
  page 246: 3, 7, 13, 21, 27

1.6.2 Exercises

In Exercises 1 - 12, sketch the graph of the given function. State the domain of the function, identify any intercepts and test for symmetry.

9. $f(x) = \sqrt{5 - x}$

domain $= (-\infty, 5]$

To avoid taking the square root of a negative number,

$5 - x \geq 0$

$5 \geq x$

or

$x \leq 5$

domain $= \{x \mid x \leq 5\} = (-\infty, 5]$

y-intercept
set $x = 0$, solve for y

$y = \sqrt{5-0} = \sqrt{5}$ or the point $(0, \sqrt{5})$

x-intercept
set $y = 0$, solve for x

set $y=0$, solve for x

$$\sqrt{5-x}=0$$

$$5-x=0$$

$$\boxed{x=5}$$

$f(-x)=f(x)$ all $x \in$ domain of f
then f is even

$f(-x)=-f(x)$ all $x \in$ domain of f
then f is odd

$$f(-x)=\sqrt{5-(-x)}=\sqrt{5+x}\stackrel{?}{=}\sqrt{5-x}$$

$$5+x=5-x$$
$$x=-x$$
only true for $x=0$

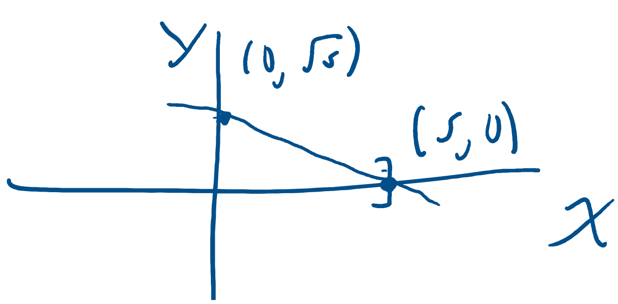
$\therefore f$ is not even

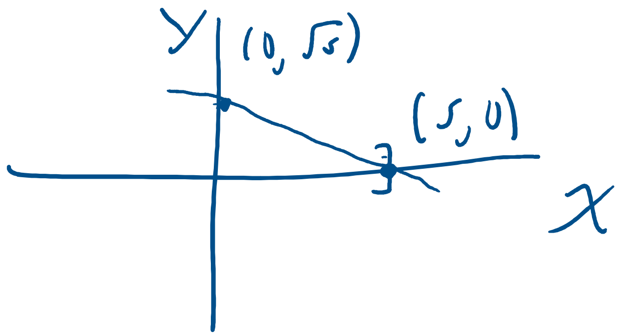
$$f(-x)=\sqrt{5-(-x)}\stackrel{?}{=}-\sqrt{5-x}$$

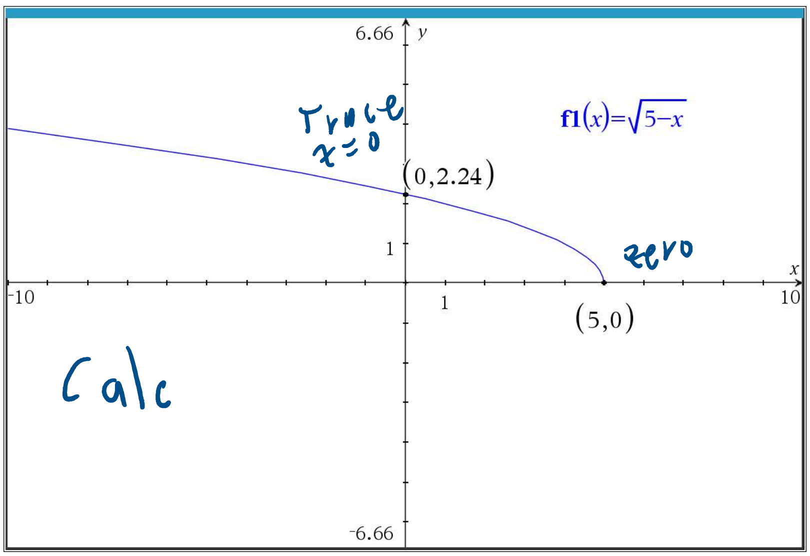
$$\sqrt{5+x}\stackrel{?}{=}-\sqrt{5-x}$$

$$5+x=5-x$$
$$x=-x$$
only true for $x=0$

$\therefore f$ is not odd







Sqrt(5)=2.23606797749979 ≈ 2.24

Convert quadratic from general form vertex
(standard form)

$$f(x) = x^2 + 2$$

want $f(x) = a(x-h)^2 + k$ vertex (h, k)

$$f(x) = 1(x-0)^2 + 2$$

vertex $(0, 2)$

$$f(x) = x^2 + 2 = ax^2 + bx + c$$

$$a = 1,\ b = 0,\ c = 2$$

$$f(x) = a(x-h)^2 + k$$

$f(x) = a(x-h)^2 + k$

convert to general form

$f(x) = a(x^2 - 2xh + h^2) + k$

$f(x) = ax^2 - 2ahx + (ah^2 + k)$

$f(x) = ax^2 + bx + c$

$a = a$

$b = -2ah$

$c = ah^2 + k$

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convert $f(x) = ax^2 + bx + c$

to vertex form by completing the square

$f(x) = (ax^2 + bx) + c$

$= a\left(x^2 + \left(\frac{b}{a}\right)x\right) + c$

$\left(\frac{1}{2}\right)\left(\frac{b}{a}\right) = \frac{b}{2a}$

$\left(\frac{b}{2a}\right)^2 = \frac{b^2}{4a^2}$

$f(x) = a\left(x^2 + \frac{bx}{a} + \frac{b^2}{4a^2} - \frac{b^2}{4a^2}\right) + c$

$f(x) = a\left(x^2 + \frac{bx}{a} + \frac{b^2}{4a^2}\right) - \frac{ab^2}{4a^2} + c$

$f(x) = a(x + b\ )^2 - \ \ b^2 \ldots$

$$f(x) = a\left(x + \frac{b}{2a}\right)^2 - \frac{b^2}{4a} + c$$

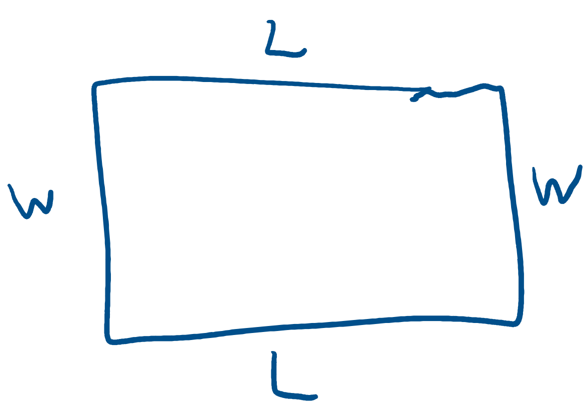
$$f(x) = a\left(x + \frac{b}{2a}\right)^2 - \frac{b^2}{4a} + \frac{4ac}{4a}$$

$$\boxed{f(x) = a\left(x - \left(\frac{-b}{2a}\right)\right)^2 + \frac{-b^2 + 4ac}{4a}}$$

$$\boxed{h = -\frac{b}{2a}} \quad \boxed{k = \frac{4ac - b^2}{4a}}$$

2.3

20. In the situation of Example 2.3.4, Donnie has a nightmare that one of his alpaca herd fell into the river and drowned. To avoid this, he wants to move his rectangular pasture *away* from the river. This means that all four sides of the pasture require fencing. If the total amount of fencing available is still 200 linear feet, what dimensions maximize the area of the pasture now? What is the maximum area? Assuming an average alpaca requires 25 square feet of pasture, how many alpaca can he raise now?



Let L = length
W = width

$$\boxed{2L + 2W = 200 \text{ ft}}$$

let A = area of rectangle

Find L and W to maximize A

$$\boxed{A = LW}$$

$$2L + 2W = 200$$

$$L + W = 100$$

$L + w = 100$

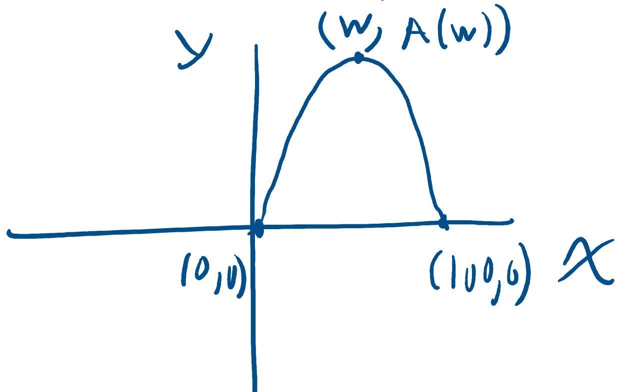
$$\boxed{L = 100 - w}$$

$A = (100 - w)w = -w^2 + 100w$

Now, find w to maximize A

$0 \le w \le 100$

Find the vertex of the parabola



$$A(w) = -w^2 + 100w$$
$$= -(w^2 - 100w)$$

$$\frac{(-100)}{2} = -50$$

$$50^2 = 2500$$

$$A(w) = -(w^2 - 100w + 2500) + 2500$$

$$\boxed{A(w) = -(w - 50)^2 + 2500}$$

vertex $(50, 2500)$

$w = 50$, max $A = 2500$

$L = 100 - 50 = \boxed{50}$

$L = 100 - 50 = \boxed{50}$

$$\boxed{\text{Maximum area is } 2500 \text{ ft}^2 \text{ with length} = \text{width} = 50 \text{ ft}}$$