

Horizons on Lake Erie:

Using:

Earth radius = 4000 miles, at sea level,
 Lake Erie surface is 572 ft above sea level,
 Erie city is 702 ft above sea level.

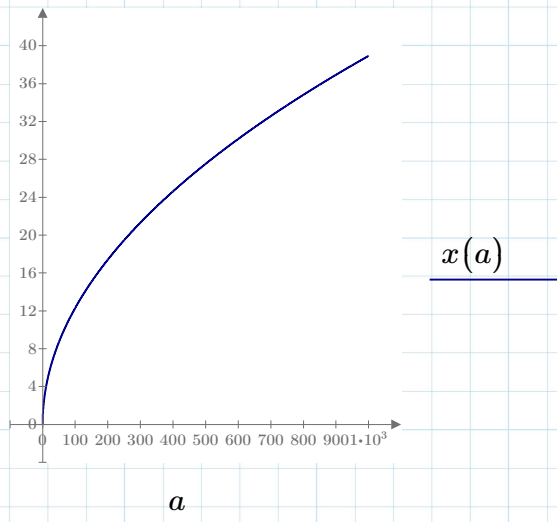
a is in feet and is the height of the Erie observer's eyes above lake level.
 x is in miles and is the distance from observer to horizon.

$$a := 0, .1 \dots 1000$$

$$x(a) := \sqrt{\left(4000 + \frac{a + 572}{5280}\right)^2 - \left(4000 + \frac{572}{5280}\right)^2}$$

Results:

$x(6) = 3.015$ On the beach
 $x(130) = 14.035$ City street level
 $x(330) = 22.361$ Waldameer ferris wheel



Viewing Canada:

To calculate the height $r(a)$, in feet, of a building on the Canadian shore (30 miles from observer) whose top is just visible on the horizon:

$$y(a) := 30 - x(a) \quad h(a) := \sqrt{y(a)^2 + \left(4000 + \frac{572}{5280}\right)^2}$$

$$r(a) := \left(h(a) - \left(4000 + \frac{572}{5280}\right)\right) \cdot 5280$$

Results:

$r(6) = 480.582$ On the beach
 $r(130) = 168.221$ City street level
 $r(330) = 38.512$ Waldameer ferris wheel

The arc represents the Lake Erie surface, 572 feet above sea level.
This sketch is way out of proportion, but it will serve to define things.

