Announcements

- HW 8 out ~~Tuesday~~ Monday Evening; due Fri

$=$ http://www.math.sc.edu/~milans/teaching/fall

4.3: Find Global min / max of

$f(x) = 2 + e^{-x^2}$ ~~over~~ for $-1 \le x \le 3$.

Soln: $\cdot\ f'(x) = \frac{d}{dx}\left[2 + e^{-x^2}\right]$

$$= e^{-x^2} \cdot \frac{d}{dx}\left[-x^2\right]$$

$$= e^{-x^2} \cdot (-2x)$$

$e^{-x^2} \cdot (-2x) = 0$

$e^{-x^2} = 0$ or $-2x = 0$

No Soln $\qquad x = 0$.

$f(x) = 2 + e^{-x^2}$ (2)

$$f(-1) = 2 + e^{-(-1)^2}$$
$$= 2 + e^{-1}$$
$$= 2 + \frac{1}{e} \approx 2.37$$

$$f(0) = 2 + e^{-0^2} = 2 + e^0 = 2 + 1 = 3$$

$$f(3) = 2 + e^{-(3)^2} = 2 + e^{-9} \approx 2.0001$$

So on $[-1, 3]$, f has a global max at $x = 0$ and a global min at $x = 3$.

- Find global min/max of $f(x) = 2 + e^{-x^2}$ for $0 \le x$.

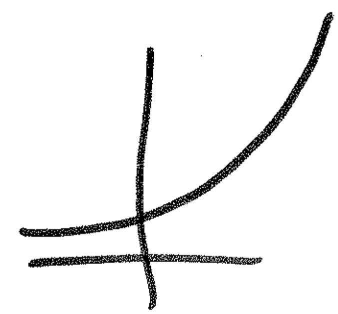
(1): Find critical points. (Already found $x = 0$ was the only crit. point.

(2) • $f(0) = 3$

• what about the other "endpoint"?

Need to know how $f(x)$ behaves as $x \to \infty$

$$f(x) = 2 + e^{-x^2}$$
$$= 2 + \frac{1}{e^{x^2}}$$

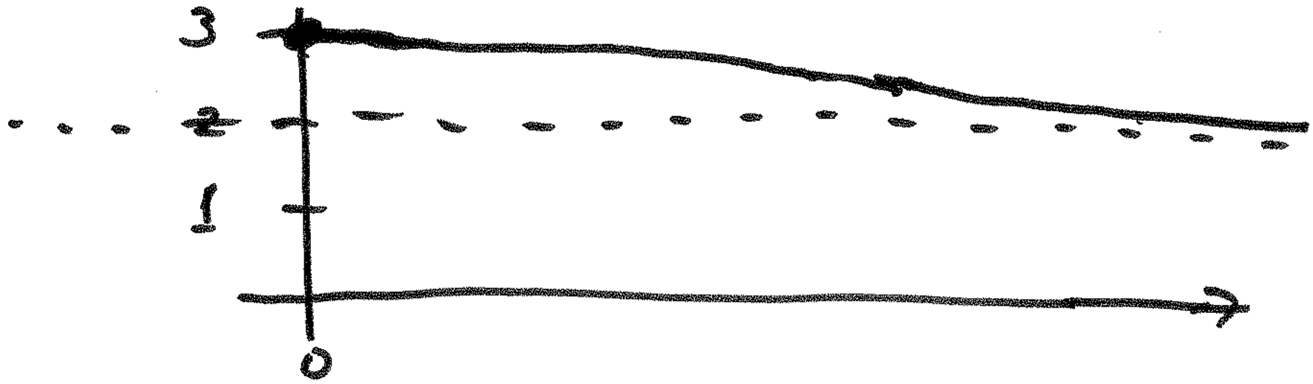


- When x is large, e^{x^2} is a huge pos. number.

- So $\dfrac{1}{\text{huge pos num}}$ = small pos number.

- So ~~ax~~ when x is large, $f(x)$ is a little above 2.

- As $x \to \infty$, $f(x) \to 2$.



In $[0, \infty)$

- So f has a global max at $x = 0$
- f has no global min.

4.4

Ex #21. Demand for tickets to an amusement park is given by $p = 70 - 0.02q$ where p is the price of a ticket in dollars and q is the number of people that attend.

Warmup (a) What price generates attendance of 3000? What is the total revenue at that price?

Soln $p = 70 - 0.02(3000)$
$= \boxed{\$10}$

Total Revenue: $p \cdot q = 10 \cdot 3000 = \boxed{\$30{,}000}$

(b) Write a formula for total revenue as a function of q, # people that attend.

Soln $R(q) = p \cdot q$

$= (70 - 0.02q) \cdot q = 70q - 0.02q^2$

(c) What attendance maximizes revenue?

Soln: Find global max of $R(q)$ for q in $[0, \infty)$.

- $R'(q) = 70 - 0.04q$

- $70 - 0.04q = 0$

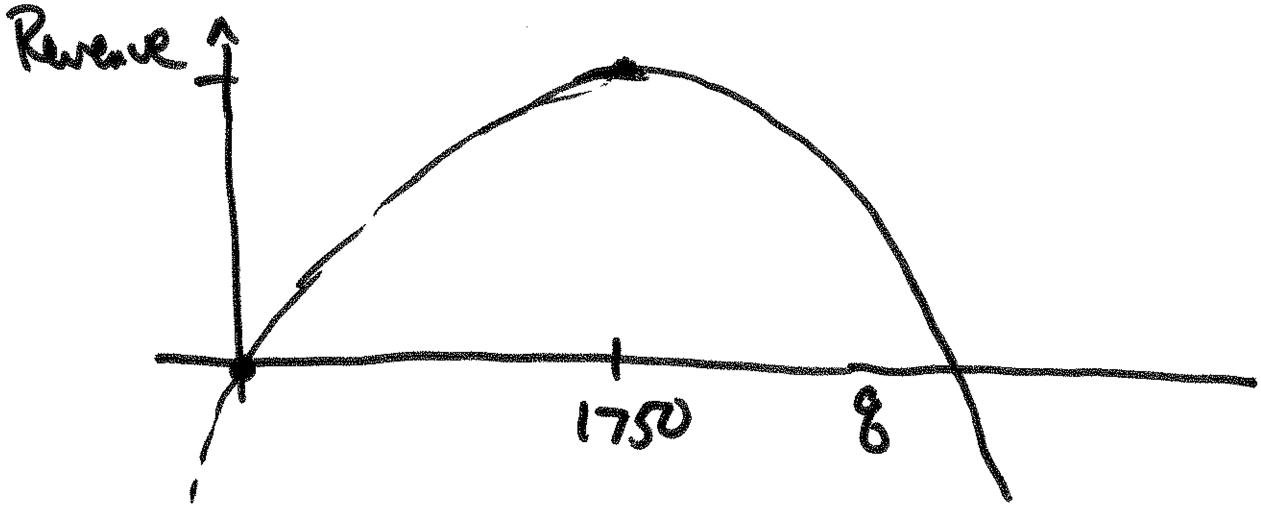
$70 = 0.04q$

$q = 1750$

- Check R at crit. points and endpoints:

- $R(0) = 0$
- $R(1750) = (70 - 0.02 \cdot 1750) \cdot 1750 = 61250$

As $q \to \infty$, $R(q) \to -\infty$ since $R(q)$ is a parabala ~~that~~ $\cap$



So $q = 1750$ is a global max that maximize Revenue.

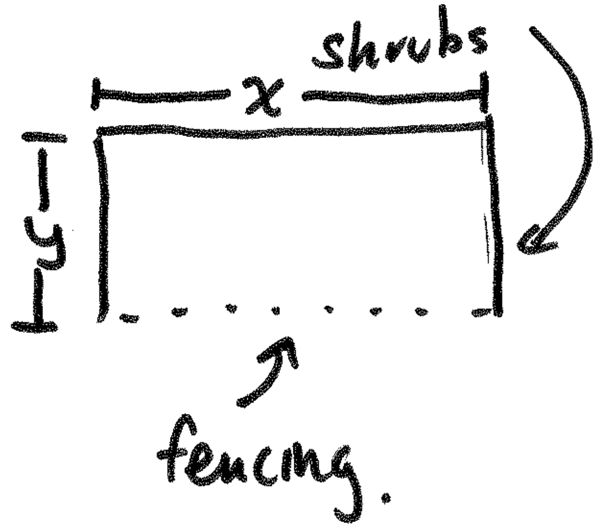
(d) What price should the park charge to maximize revenue?

<u>Soln:</u> $p = 70 - 0.02q$

$$p = 70 - 0.02(1750)$$
$$= \boxed{\$35}.$$

#26. A landscape architect plans to enclose a 3000 sq. ft rectangular region in a botanical garden. Three of the sides are enclosed by shrubs at a price of \$45/foot. The fourth side uses fencing at a price of \$20/foot. Find the minimum total cost.

Soln:



Know:

- $xy = 3000$
- $y = \frac{3000}{x}$

- Cost $= 45(y + x + y) + 20x$

$$= 45(2y + x) + 20x$$

$$= 45\left(2 \cdot \frac{3000}{x} + x\right) + 20x$$