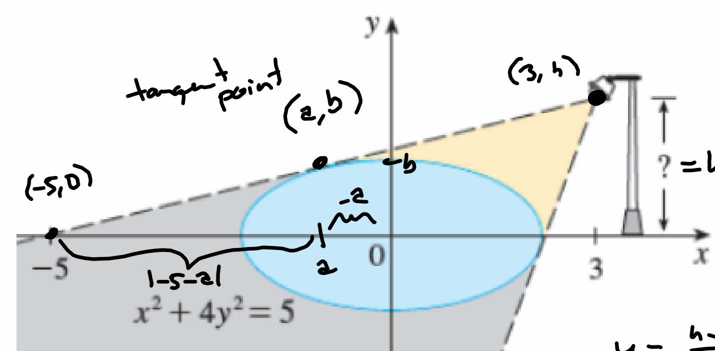


$|-5-a| = a+5$

$-a + a+5$

Eq'n of line is:

$y = \frac{h-0}{3+5}(x+5) + 0$

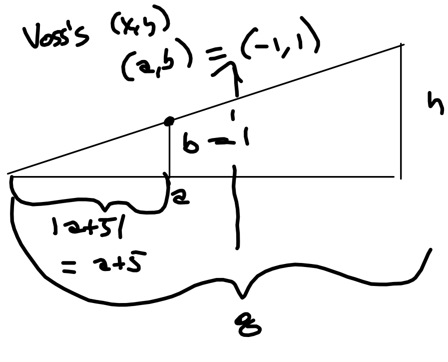
$= \frac{h}{8}(x+5)$

4. (10 pts) The figure shows a lamp located three units to the right of the y-axis and a shadow created by the elliptical region $x^2 + 4y^2 \leq 5$. If the point $(-5, 0)$ is on the edge of the shadow, how far above the x-axis is the lamp located? Do the best writeup possible for this exercise.

$x^2 + 4y^2 = 5$

$2x + 8yy' = 0$

$\longrightarrow y' = \frac{-2x}{8y} = -\frac{x}{4y} = \frac{h}{8} = \frac{a}{4b}$



$m_{tan} = \frac{h}{8} = \frac{b}{a+5} =$

(a,b) is on the ellipse $\longrightarrow$

(a,b) is on the line

$y = \frac{h}{8}(x+5)$

$b = \frac{h}{8}(a+5)$

$8b = ah + 5h$ $\qquad a^2 + 4b^2 = 5$

$y' = -\frac{x}{4y} = \frac{y}{x+5} \longrightarrow$

$-x^2 - 5x = 4y^2$

$\longrightarrow x^2 + 4y^2 = -5x = 5$

Bradley's $x = -1 = a$ mine

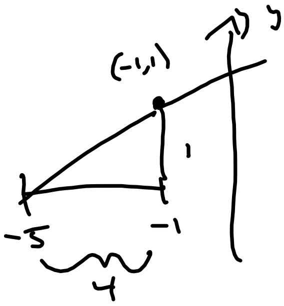
$x^2 + 4y^2 = 5$ $\qquad (a,b) = (-1, 1)$

$(-1)^2 + 4y^2 = 5$

$4y^2 = 4$

$y^2 = 1$

$y = \pm 1 = \boxed{1 = y}$



$m = \frac{1}{4} = \frac{h}{8} \longrightarrow h = \frac{8}{4} = 2$

#6 Section 2.9

Verify the given linear approximation at $a = 0$. Then use a graphing calculator or computer to determine the values of x for which the linear approximation is accurate to within 0.1. (Round your answers to three decimal places. Enter your answer using interval notation.)

$$(1 + 4x)^{-4} \approx 1 - 16x$$

$f(x) = (4x+1)^{-4}$

$f(0) = 1^{-4} = 1 \rightsquigarrow (x_1, y_1) = (x_1, f(x_1)) = \boxed{(0, 1)}$

$f'(x) = -4(4x+1)^{-5}(4)$

$f'(0) = -4(1^{-5})(4) = \boxed{-1 = f'(0) = m_{tan}}$ $\rightarrow -16$

$L(x) = f'(x_1)(x - x_1) + f(x_1)$

$= -1(x-0) + 1$ $\rightarrow -16$

$= -x + 1$

$y = -16x + 1$

Now, we want to know the range of x-values for which $|f(x) - L(x)| < 0.1$

i.e., we want $|(4x+1)^{-4} - (-16x+1)| < 0.1$

$\longrightarrow -0.1 < (4x+1)^{-4} + 16x - 1 < 0.1$

$x \in (-0.02268, 0.027695) \approx (-0.023, 0.028)$

$|f(x) - L(x)| < 0.1$

I rounded up! Not good!

Correct answer (Don't round up, Steve!)

$x \in (-.022, 0.027) \longrightarrow$

$|f(x) - L(x)| < 0.1$

Book Did:

$(4x+1)^{-4} - 0.1 < -16x + 1 < (4x+4)^{-4} + 0.1$

Difference is 0.1

https://www.wolframalpha.com/input?i=solve%28%284x%2B1%29%5E%28-4%29%2B16x-1%3D0.1

Difference is - 0.1

$-.02769$

We did this with Desmos

$|(4x+1)^{-4} - (-16x+1)| < 0.1$

$\Rightarrow (4x+1)^{-4} + 16x - 1 = 0.1$

$(4x+1)^{-4} + 16x - 1 = -0.1$

$(4x+1)^{-4} = -16x + 1.1$

$(4x+1)^{-4} = -16x + 0.9$