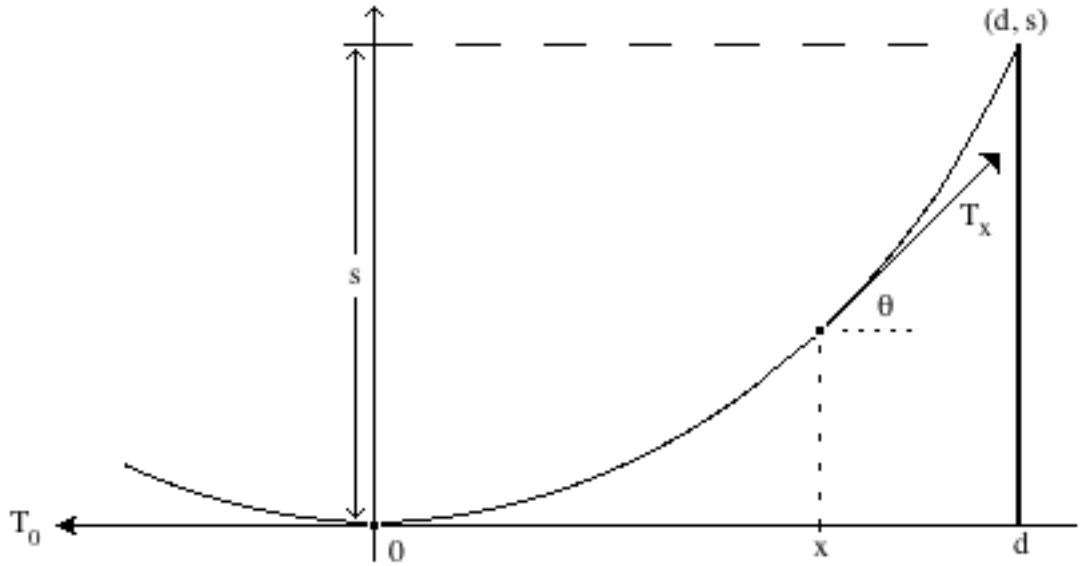
Quiz 2, Math 110, February 12, 1996 NAME _____

The diagram below depicts the cable over the center span of a suspension bridge. The line at d represents one of the towers and s is the sag in the cable. The tension at 0 is T_0 and that over the point x is T_x. Let w be the total weight per foot that the cable supports.



Let $y = f(x)$ with $0 \le x \le d$ be the function whose graph is the curve of the cable.

i) Explain why $T_0 = T_x \cos\theta$ and $wx = T_x \sin\theta$.

ii) Show that $f'(x) = \frac{wx}{T_0} = \frac{w}{T_0} x$.

iii) Show that $f(x) = \frac{w}{2T_0} x^2$.

iv) Show that $T_0 = \frac{1}{2}\frac{wd^2}{s}$

v) Show that $T_x = w\sqrt{\frac{1}{4}\frac{d^4}{s^2} + x^2}$

vi) Compute the maximal tension in the cable of a bridge for which the parameters are w = 20,000 pounds per foot, d = 2000 feet, and s = 300 feet.