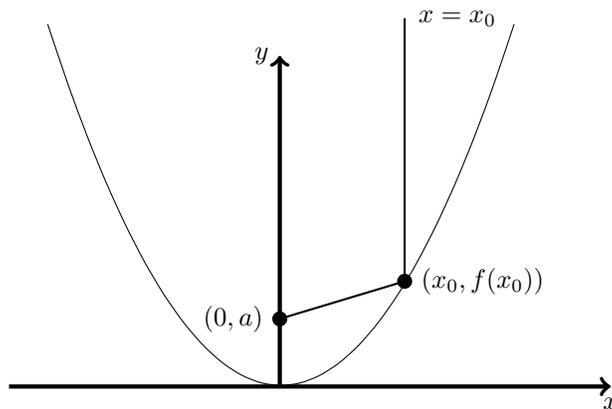


Math 131-H – Homework 2 – Tangent Lines

Due: in class on Tuesday October 1st.

1. Consider the function $f(x) = \frac{1}{4a}x^2$ whose graph is a parabola with focus at the point $(0, a)$. The *reflection property* of the parabola says that the reflection of any vertical straight line in the parabola will pass through the focus.



- (a) Find the y -intercept of the tangent line to the parabola at the point $(x_0, f(x_0))$ (that is, the point where the tangent line meets the y axis).
- (b) Show that the triangle with vertices at $(x_0, f(x_0))$, the focus of the parabola, and the y -intercept from (a), is isosceles.
- (c) Hence show that the reflection property holds.
2. Let (x_0, y_0) be a point in the plane. How many tangent lines to the hyperbola $y = 1/x$ pass through the point (x_0, y_0) in the following cases:
- (a) When $x_0y_0 > 1$?
- (b) When $x_0y_0 = 1$?
- (c) When $0 < x_0y_0 < 1$?
- (d) When $x_0y_0 = 0$, but $(x_0, y_0) \neq (0, 0)$?
- (e) When $(x_0, y_0) = (0, 0)$?
- (f) When $x_0y_0 < 0$?

In each case, find the equations of all the tangent lines through the point (x_0, y_0) .