Practice problems

Math 1110 - Instructor: Itamar Oliveira

Name: ____________

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1. Find numbers a and b such that

$$\lim_{x \to 0} \frac{\sqrt{ax+b}-2}{x} = 1.$$

2. The figure below shows a point P on the parabola $y = x^2$ and the point Q where the perpendicular bisector of OP intersects the $y-axis$. As P approaches the origin along the parabola, what happens to Q? Does it have a limiting position? If so, find it.

3. Evaluate the following limits, if they exist, where $\lfloor x \rfloor$ denotes the greatest integer function (also known as the floor function).

   (a) $\lim_{x \to 0} \frac{\lfloor x \rfloor}{x}$.

   (b) $\lim_{x \to 0} x \left\lfloor \frac{1}{x} \right\rfloor$.

4. Find all values of a such that f is continuous on $\mathbb{R}$:

$$f(x) = \begin{cases} x+1 & \text{if } x \leq a \\ x^2 & \text{if } x > a \end{cases}$$

5. If $\lim_{x \to a}[f(x)+g(x)] = 2$ and $\lim_{x \to a}[f(x)-g(x)] = 1$, find $\lim_{x \to a}[f(x)g(x)]$.