Lab Time: **Your Name:**
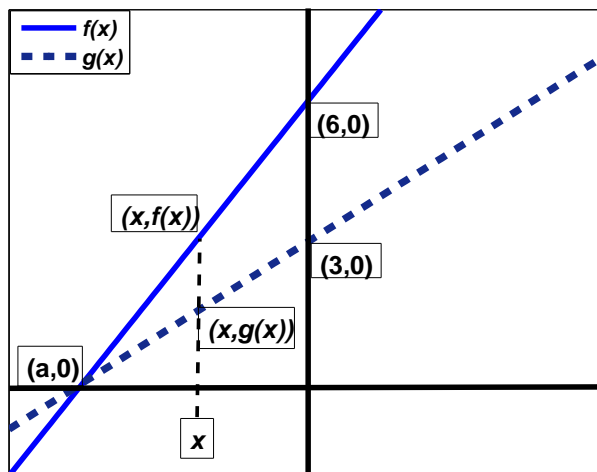
GOAL: This quiz is designed to illuminate your understanding of limits, visually, computationally and conceptually.

1. (*20 points TOTAL.*) Consider the two *unknown* **linear** functions $f(x)$ and $g(x)$ graphed in the figure above. The two lines have different y-intercepts but share the same x-intercept.

Evaluate the following limits. In each case, EXPLAIN YOUR ANSWER. If you do not think the limit exists, explain why.

(a) (*3 points.*) $\displaystyle\lim_{x\to 0^-} f(x)$

(b) (*3 points.*) $\displaystyle\lim_{x\to a^+} g(x)$

(c) (*3 points.*) $\displaystyle\lim_{x\to 0} \frac{f(x)}{g(x)}$

(d) (*3 points.*) $\displaystyle\lim_{x\to 0} f(x)g(x)$

(e) (*3 points.*) $\displaystyle\lim_{x\to 0} 4f(x) - 5(g(x)$

(f) (*5 points.*) $\displaystyle\lim_{x\to\infty} \frac{f(x)}{g(x)}$ [HINT: Use similar triangles to obtain a simple algebraic relationship between $f(x)$ and $g(x)$]

BONUS (*5 points.*) Evaluate $\displaystyle\lim_{x\to a} \frac{f(x)}{g(x)}$. Describe carefully what techniques you use to find the value of the limit, if it exists, or explain why the limit doesn't exist.