

1. (4 pts) Find a and b to make the function $f(x) = \begin{cases} 2^x & \text{if } x \leq 3 \\ \frac{a}{x} & \text{if } 3 < x < 8 \\ 4x + b & \text{if } x \geq 8 \end{cases}$ continuous everywhere.

2. (6 pts) For each of the following limits, either determine its value or demonstrate that the limit does not exist.

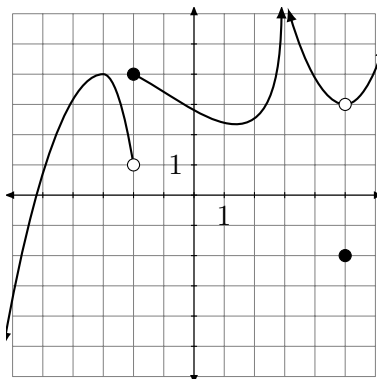
(a) $\lim_{r \rightarrow -3} \frac{r^2+r-6}{r^2+3r}$

(b) $\lim_{x \rightarrow 2} \sqrt{4 - 2x}$

(c) $\lim_{t \rightarrow 1^-} \frac{2t-2}{t^3+3t-7}$

3. (4 pts) Use epsilon-delta methods to prove that $\lim_{x \rightarrow 3} -5x + 4 = -11$.

4. (6 pts) Below is the graph of a function $g(x)$. For each of the six quantities listed to the right, either give its value or specifically state that it does not exist.



$\lim_{x \rightarrow -3} g(x)$ $g(-2)$

$\lim_{x \rightarrow -2^+} g(x)$ $\lim_{x \rightarrow 3} g(x)$

$\lim_{x \rightarrow -2^-} g(x)$ $\lim_{x \rightarrow 5} g(x)$

5. (2 pt bonus) When x is a nonzero rational number which is written in lowest terms as $\frac{p}{q}$, let $f(x) = \frac{1}{p}$; when x is irrational, let $f(x) = 0$. Find, with justification, the value of $\lim_{x \rightarrow 0} f(x)$.