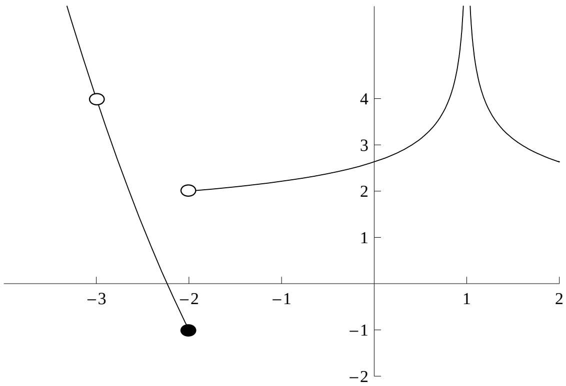
1. **(4 points)** *For the plot of $g(x)$ shown below, indicate whether or not each of the following quantities can be evaluated. If they can be evaluated, compute their values. If they cannot be evaluated, explain why.*



$g(-2) = -1$, as indicated by the solid dot.

$\lim_{x \to -3^-} g(x) = 4$, since slightly to the left of the open circle at $(-3, 4)$, $f(x)$ is close to 4.

$\lim_{x \to -2} g(x)$ does not exist because of a jump discontinuity.

$\lim_{x \to 1^+} g(x)$ does not exist, since $g(x)$ increases without bound as x approaches 1 from above.

2. **(4 points)** *The table below describes the distance traveled on a cross-country drive over a six-hour period.*

Time	Noon	1PM	2PM	3PM	4PM	5PM	6PM
Distance in miles	0	65	150	230	270	350	420

Calculate these properties of the trip:

(a) **(2 points)** *The average speed over the course of the entire six-hour period.*

In six hours, the car has traveled 420 miles, so the average speed is $\frac{420}{6} = 70$ miles per hour.

(b) **(2 points)** *The average speed between 2:00 PM and 4:00 PM.*

In two hours, the car has traveled $270 - 150 = 120$ miles, so the average speed during this period is $\frac{120}{2} = 60$ miles per hour. This can also be expressed as the more standard average-speed formutation $\frac{270-150}{4-2} = \frac{120}{2} = 60$.

3. **(4 points)** *Evaluate the following limits, or explicitly state that they do not exist and explain why they cannot be evaluated.*

(a) **(2 points)** $\lim_{x \to 1} \frac{x^2-4}{x^3-3x+4}$.

1 is in the domain of this rational function, so we simply evaluate it at 1 to get $\frac{1^2-4}{1^3-3 \cdot 1+4} = \frac{-3}{2}$.

(b) **(2 points)** $\lim_{s\to 4}\sqrt{4-s}$.
For s slightly larger than 4, $4-s$ is negative so $\sqrt{4-s}$ is not evaluatable in the real numbers. Thus, this limit does not exist since the right-side limit, in particular, does not exist.

4. **(4 points)** *Using epsilon-delta methods, prove that* $\lim_{x\to 2}\frac{2x^2-7x+6}{x-2}=1$.

Given an ϵ, we want to derive a δ such that if x is within δ of 2, then $\frac{2x^2-7x+6}{x-2}$ is within ϵ of 1. We start with the latter restriction, and then try to derive, via reversible steps, the necessary value of x:

$$\begin{aligned}
\left|\frac{2x^2-7x+6}{x-2}-1\right| &< \epsilon \\
\left|\frac{(2x-3)(x-2)}{x-2}-1\right| &< \epsilon \\
|2x-3-1| &< \epsilon \text{ and } x\neq 2 \\
|2x-4| &< \epsilon \text{ and } x\neq 2 \\
|x-2| &< \frac{\epsilon}{2} \text{ and } x\neq 2 \\
0<|x-2| &< \frac{\epsilon}{2}
\end{aligned}$$

so an ϵ-bound on $\frac{2x^2-7x+6}{x-2}$ is equivalent to an $\frac{\epsilon}{2}$-bound on x, so any choice of $\delta \leq \epsilon 2$ will suffice.

5. **(4 points)** *Find a value of a such that the given function is continuous everywhere:*

$$f(t)=\begin{cases} at \text{ if } t\leq 3 \\ t^2-a \text{ if } t>3 \end{cases}$$

Since the only possible discontinuity exists at $t=3$, to ensure continuity throughout, we must make sure the left- and right-side limits at $t=3$ are identical. The limit from the left at $t=3$ is the behavior to the left of $t=3$ evaluated at 3, that is to say, $a\cdot 3$. The right-side limit, on the other hand, is 3^2-a. Thus, $3a=9-a$, so $4a=9$, so $a=\frac{9}{4}$.