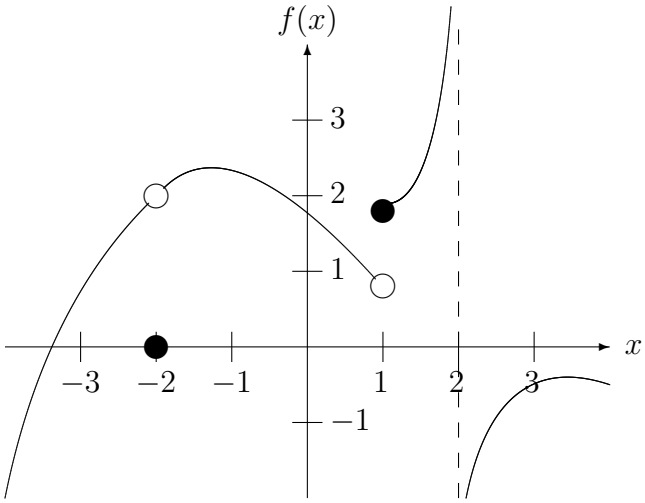
1. **(6 points)** Find an equation of the line which passes through the points $(4, -1)$ and $(-3, -2)$. Write your answer in slope-intercept form.

2. **(8 points)** Find all solutions to the equation $\sin(6t) = -1$.

3. Use the graph below to answer the following questions. If you are asked to find a limit that does not exist, then write "DNE" in the answer box. If you are asked to find the value of a function where the function is undefined, then write "undefined" in the answer box.



(a) **(3 points)** What is $\lim_{x \to -2^+} f(x)$?

(b) **(3 points)** What is $\lim_{x \to -2} f(x)$?

(c) **(3 points)** What is $f(-2)$?

(d) **(3 points)** What is $\lim_{x \to 1^-} f(x)$?

(e) **(3 points)** What is $\lim_{x \to 1} f(x)$?

(f) **(3 points)** What is $f(1)$?

4. The price p of a typical new car (in dollars) can be modeled by the equation

$$p(t) = 24t^2 + 250t + 9000,$$

where t is the number of years after January 1, 1985.

(a) **(4 points)** What was the price of a typical new car on January 1, 2000?

(b) **(8 points)** What was the average rate of change of the price of a typical car between January 1, 1985 and January 1, 2000?

5. **(10 points)** A buoy on the ocean moves up and down with the waves. At its highest point, the buoy is 30 feet above the ocean floor, and at its lowest point, it is 20 feet above the ocean floor. The buoy returns to its highest point once every five seconds. Write an equation of the form $H(t) = a\cos bt + k$ which models the buoy's height H (in feet) after t seconds, assuming that the buoy is at its highest point when $t = 0$.

6. **(10 points)** The function $f(x) = 2x^2 + 5x$ has the derivative $f'(x) = 4x + 5$. Use the function and its derivative to find an equation of the tangent line to the graph of $f(x)$ at the point with an x–coordinate of -1.

7. Determine each of the following limits. If the limit does not exist, then write "DNE" in the answer box.

(a) **(6 points)** $\lim_{x\to 0}\left(\dfrac{x^2-3x+1}{\sqrt{x^2-5x+9}}\right)$

(b) **(6 points)** $\lim_{x\to \pi}\left(\dfrac{x}{\sin x}\right)$

(c) **(6 points)** $\lim_{x\to 2}\left(\dfrac{x^2+9x-22}{x^2-4}\right)$

(d) **(6 points)** $\lim_{x\to \pi/2}\left(\dfrac{\sin^2(x)-1}{1-\sin x}\right)$

8. **(12 points)** Use the definition of the derivative to find $f'(x)$ if $f(x) = \dfrac{1}{x^2 - 1}$.

(*Note: The definition of the derivative is*

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}.$$

No credit will be given for finding the derivative using any other method.)