1. If $f(x) = x^2 + 2x - 4$, what is the average rate of change of $f(x)$ on the interval $[3, 8]$?

2. Let $f(x) = \dfrac{7}{x-5}$. Compute the difference quotient for $f(x)$ at $x = 3$ with $h = 0.1$.

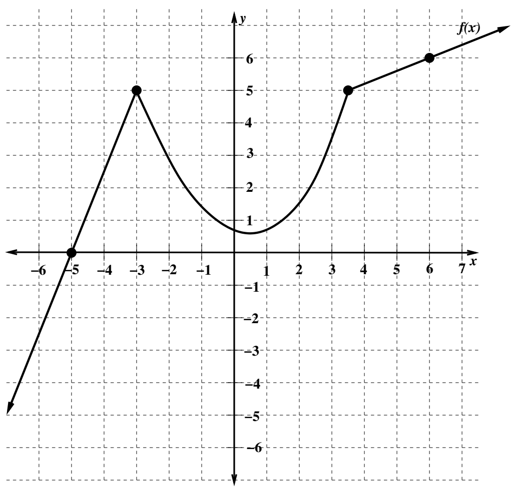
3. Let $f(x) = \sqrt{x+7}$. What is the instantaneous rate of change of $f(x)$ at $x = 2$?

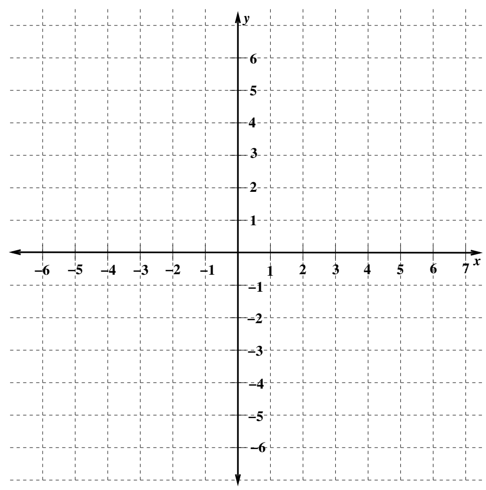
4. If $f(x) = \dfrac{x}{x+2}$,

   (a) Find $f'(x)$.

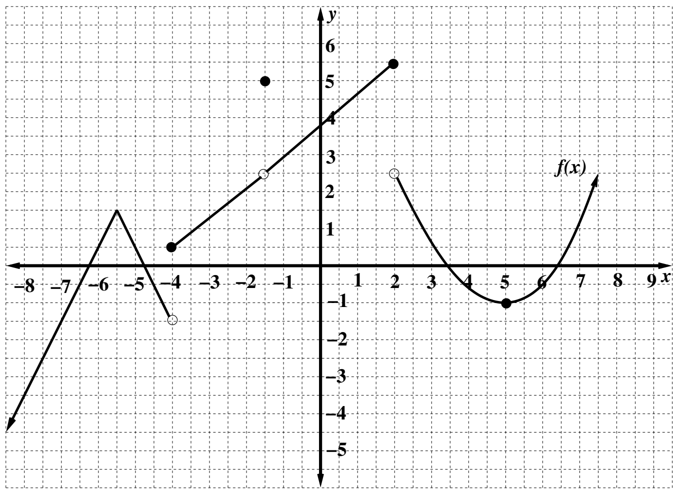
   (b) What is the equation of the line tangent to the graph of $f(x)$ at $x = 1$?

5. Given the graph of $f(x)$, sketch a graph of $f'(x)$





6. Use the graph of $f(x)$ to determine the following:



(a) $\lim\limits_{x \to 2} f(x)$

(b) $\lim\limits_{x \to -1.5} f(x)$

(c) $\lim\limits_{x \to -4^-} f(x)$

(d) $\lim\limits_{x \to -5.5} (2 + [f(x)]^2)$

(e) $f'(-6)$

(f) The value(s) of x for which $f(x)$ is discontinuous. Also, state which condition of the definition of continuity is the first to fail.

(g) the value(s) of x for which $f(x)$ is non-differentiable.

7. Evaluate the limits. If the limit does not exist because of infinite behavior, describe the infinite behavior.

(a) $\lim\limits_{x \to 4} \dfrac{2x^3 - 7x^2 - 4x}{x - 4}$

(b) $\displaystyle\lim_{x\to 10} \frac{x+1}{x^2-20x+100}$

(c) $\displaystyle\lim_{x\to -\infty} \frac{5+e^{2x}-8e^{-x}}{e^x-4e^{-x}+9}$

8. Determine all vertical asymptote(s) and the location of all hole(s) of $f(x)=\dfrac{(x-3)^5(x+2)(x-5)}{(x-2)(x-5)(x+2)^2}$.

9. Determine the interval(s) on which each of the following functions is continuous:

(a) $f(x) = \dfrac{x-5}{\sqrt{x+1}} + \ln(8-x)$

(b) $f(x) = \begin{cases} \dfrac{x+1}{2x^2-3x-9} & \text{if } x < 1 \\ x^2+1 & \text{if } x \geq 1 \end{cases}$