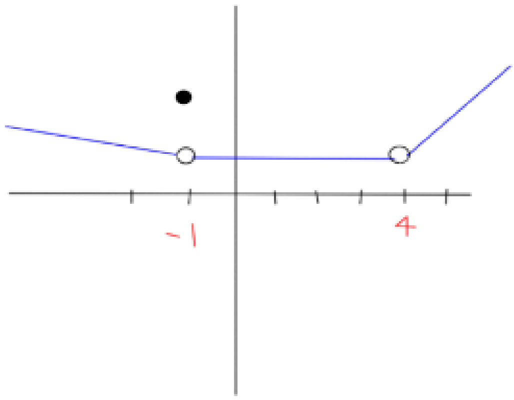
1. 1.8; Exercise 6. "Sketch the graph of a function f that is continuous except for the stated discontinuity. Discontinuous at -1 and 4, but continuous from the left at -1 and from the right at 4."

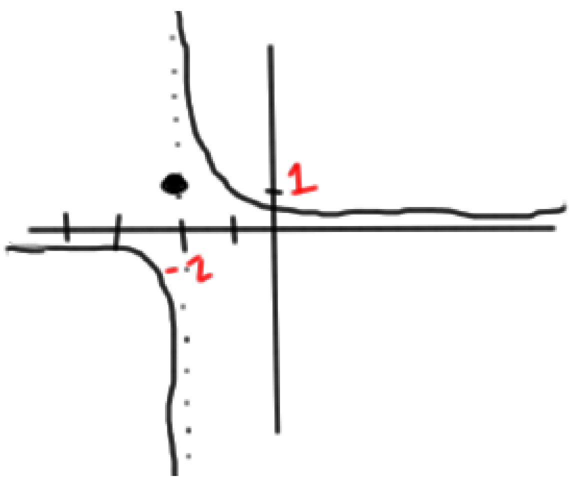
   A sample graph is shown. Many other graphs are possible.



2. 1.8; Exercise 18. "Explain why the function is discontinuous at the given number a. Sketch the graph of the function."

$$f(x) = \begin{cases} \frac{1}{x+2} & \text{if } x \neq -2 \\ 1 & \text{if } x = -2 \end{cases} \qquad a = -2$$

   $f(x)$ is not continuous at $x = -2$ because it has a vertical asymptote at $x = -2$. To graph the function, use the standard function $\frac{1}{x}$ and shift it horizontally to the left 2, then draw the point at $x = -2$.



3. 2.1; Exercise 8. "Find an equation of the tangent line to the curve at the given point."

$$y = \frac{2x+1}{x+2} \qquad (1,1)$$

   Start by finding the slope of the tangent line, that is, the derivative at $a = 1$. The limit definition of the derivative at a point is:

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

In this case, this equals

$$f'(1) = \lim_{h\to 0} \frac{\frac{2(1+h)+1}{(1+h)+2} - 1}{h}.$$

Keep simplifying until you can use direct substitution.

$$\lim_{h\to 0} \frac{\frac{2(1+h)+1}{(1+h)+2} - 1}{h} = \lim_{h\to 0} \frac{\frac{3+2h}{3+h} - \frac{3+h}{3+h}}{h} =$$

$$\lim_{h\to 0} \frac{3+2h-3-h}{3+h}\frac{1}{h} = \lim_{h\to 0} \frac{h}{3+h}\frac{1}{h} = \lim_{h\to 0} \frac{1}{3+h} = \frac{1}{3}$$

The slope of the tangent line is $m = \frac{1}{3}$. Use the point slope form and the known point $(1,1)$ to finish the equation: $y - y_1 = m(x - x_1)$. $y - 1 = \frac{1}{3}(x-1)$. After simplifying and solving for y, we get the equation $y = \frac{1}{3}x + \frac{2}{3}$.

4. 2.1; Exercise 28. "Find $f'(a)$."

   For the exercises in this section, it is important to use the limit definition of the derivative since the derivative rules have not been stated yet in the book. The derivative must be calculated in this way, and your work should be shown.

$$f'(a) = \lim_{h\to 0} \frac{f(a+h) - f(a)}{h} = lim_{h\to 0} \frac{2(a+h)^3 + (a+h) - 2a^3 - a}{h} =$$

$$\lim_{h\to 0} \frac{2(a^3 + 3a^2h + 3ah^2 + h^3) + h - 2a^3}{h} =$$

$$\lim_{h\to 0} \frac{2a^3 + 6a^2h + 6ah^2 + 2h^3 + h - 2a^3}{h} = \lim_{h\to 0} \frac{h(6a^2 + 6ah + 2h^2 + 1)}{h} = 6a^2 + 1.$$

5. 2.1; Exercise 42. "A roast turkey is taken from an oven when its temperature has reached 185° F and is placed on a table in room where the temperature is 75°F. The graph shows how the temperature of the turkey decreases and eventually approaches room temperature. By measuring the slope of the tangent, estimate the rate of change of the temperature after an hour." Note: The tangent line is shown on the graph.

   To do this, estimate the coordinates of two points on the pink tangent line, and then use the slope formula. Because your points are estimates, you may not get the exact slope given here. The tangent line appears to pass through the points $(30, 150)$ and $(90, 100)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{150 - 100}{30 - 90} = \frac{50}{-60} = -\frac{5}{6}$$