Derivatives and Continuity Quiz

1. We have seen that the *derivative of* $f(x)$ *at* $x = a$ can be represented two ways:

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

and

$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

   (a) Compute the derivative of $f(x) = \sqrt{2x+1}$ at $x = 0$ by using either of the definitions.

   (b) Compute the derivative of $f(x) = \frac{7}{3x+1}$ at $x = -1$ by using either of the definitions.

2. Consider the function $f(x)$ defined piecewise as :

$$f(x) = \begin{cases} x^3 - cx, & x < -2; \\ x^2 - bx + c, & -2 \leq x < 3; \\ 7 + bx & x \geq 3. \end{cases}$$

Find the values of b and c such that $f(x)$ is continuous. Remember that a function $f(x)$ is continuous at $x = a$ if $\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x)$