2.1 The Derivative as a Function

1. For each function calculate $f'(a)$ for the given value of *a*.

   a. $f(x)=2x^2+1,\ a=3$ b) $f(x)=\sqrt{2x-1},\ a=5$ c) $f(x)=\dfrac{4}{x-1},\ a=3$

2. Using the formal definition of the derivative (Definition 2.1.2) determine $f'(x)$ for each function (*this skill is also known as Finding a Derivative from First Principles*):

   a. $f(x)=x^3-2x$ b) $f(x)=\sqrt{2-x}$ c) $f(x)=4x+5$ d) $f(x)=\dfrac{x+1}{x-2}$

3. A ball is moving through space and its **position** is described by the function $s(t)=-4.9t^2+t+5$. Determine the ball's **velocity** at times $t=0,\ 2,\ 3$ seconds. (Hint: it's easiest if you find velocity as a function of time).

4. Determine the equation of the tangent to the function $g(x)=\sqrt{x-1}$, and which is parallel to the line with equation $y=\dfrac{1}{4}x-1$.

5. At what point on the graph of $f(x)=x^2-4x-5$ is the tangent parallel to $2x-y=1$?
   (From the Nelson text: Pg. 75#19)

Answers to Selected Questions:

1. a) 12 c) -1 2. b) $f'(x)=-\dfrac{1}{2\sqrt{2-x}}$ d) $f'(x)=-\dfrac{3}{(x-2)^2}$ 4. $y=\dfrac{1}{4}x+\dfrac{3}{4}$

5. $(3,-8)$