## 18 September 2014 The Derivative at a Point

(1) Use the definition

$$
f^{\prime}(a)=\lim _{x \rightarrow a} \frac{f(x)-f(a)}{x-a}
$$

to compute the derivative of the given function at $x=a$.
(a) $f(x)=x-x^{3}$ for $a=1$
(b) $g(x)=\frac{2 x+1}{x+2}$ for $a=1$
(c) $h(x)=\sqrt{x+3}$ for $a=6$
(2) Use the definition

$$
f^{\prime}(a)=\lim _{h \rightarrow 0} \frac{f(a+h)-f(a)}{h}
$$

to compute the derivative of the given function at $x=a$.
(a) $f(x)=3 x^{2}-4 x+1$ for $a=3$
(b) $g(x)=1 / x$ for arbitrary $a$ (so your answer should involve $a$ ).
(c) $h(x)=1 / x^{2}$ for arbitrary $a$
(3) The limit

$$
\lim _{x \rightarrow 1} \frac{x^{4}+x-2}{x-1}
$$

represents the derivative of some function $f$ at some point $a$. What are $f$ and $a$ ?

