Warm up Skills Topics 2.1-2.4 – The Definition of the Derivative

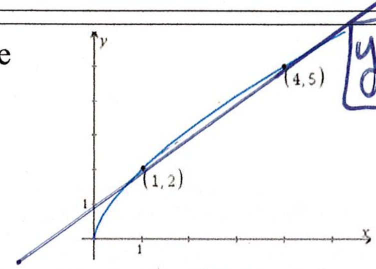
For Problem 1 & 2, the given limits represent an $f'(c)$ for a function $f(x)$ and a number c. Find f and c.

1. $\lim\limits_{\Delta x \to 0} \frac{[5-3(1+\Delta x)]-2}{\Delta x}$ $c = 1$, $f(x) = 5-3x$	**2.** $\lim\limits_{h \to 0} \frac{(-2+h)^3+8}{h}$ $c = -2$, $f(x) = x^3$

3. What does the equation $y = \frac{f(4)-f(1)}{4-1}(x-1)+f(1)$ represent? Find the equation.

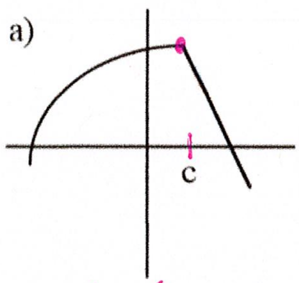
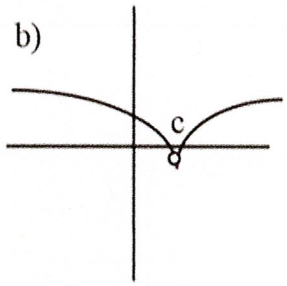
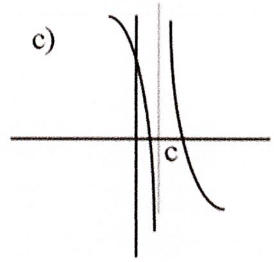
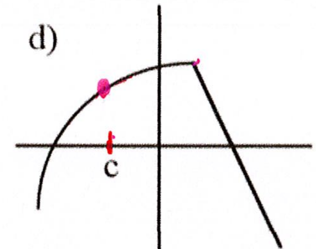
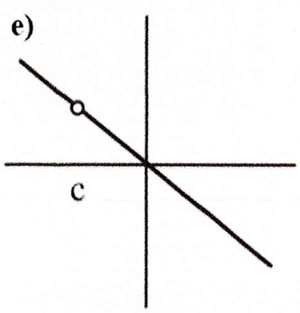
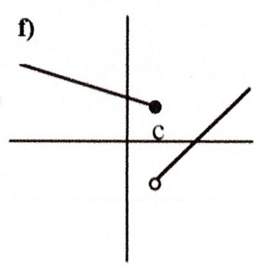
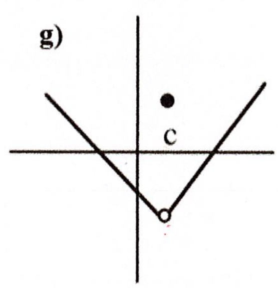
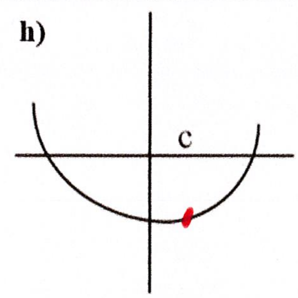
$y = \frac{5-2}{4-1}(x-1)+2$

the equation of the secant line through $(1,2)$ and $(4,5)$



$\boxed{y = (x-1)+2}$

4. For the following, state whether the function is continuous, differentiable, both or neither at $x = c$.

a)  continuous	b)  neither	c)  neither	d)  both
e)  neither	**f)**  neither	**g)**  neither	**h)**  both

5. Given the function, $f(x) = x^3 + kx$, and the line, $y = 6x - 2$, find the value of k so that the line is tangent to the function.

$f'(x) = 3x^2 + K$

① $3x^2 + K = 6 \Rightarrow K = 6 - 3x^2$

and $f(x) = y$

② $x^3 + Kx = 6x - 2$

$x^3 + (6-3x^2)x = 6x - 2$

$x^3 + 6x - 3x^3 = 6x - 2$

$-2x^3 = -2$

$\Rightarrow x^3 = 1 \Rightarrow x = 1$

$\therefore K = 6 - 3(1)^2$

$K = 3$

$f(x) = x^3 + 3x$

$y = 6x - 2$

@ $x = 1$