1) a) $g(1) = 2$
$f'(2) = -2$
$g'(1) = -\frac{1}{2}$

b) $y - 2 = -\frac{1}{2}(x-1)$

2) a) $h(-1) = -5$
$g'(-5) = -3$
$h'(-1) = -\frac{1}{3}$

b) $y + 5 = -\frac{1}{3}(x+1)$

c) $h(-3) = -4$
$g'(-4) = -5$
$h'(-3) = -\frac{1}{5}$

N: $y + 4 = -5(x+3)$

3) $g\left(\frac{\pi}{2}\right) = \frac{3\pi}{4}$

$g'(x) = -\sin x + 6x$

$g'\left(\frac{\pi}{2}\right) = -1 + 3\pi = 3\pi - 1$

$f'\left(\frac{3\pi}{4}\right) = \frac{1}{3\pi - 1}$

4) $g(-2) = -10$
$g(x) = 2x^3 - x^2 - 5x$
$g'(x) = 6x^2 - 2x - 5$

$g'(-2) = 23 \rightarrow f'(10) = \frac{1}{23}$

5) $g(x) = x^3 - 7$ $\quad f(20) = 3$

$x^3 - 7 = 20$

$x^3 = 27$ $\quad g'(x) = 3x^2$

$x = 3$ $\quad g'(3) = 27$

$g(3) = 20$

$\boxed{f'(2) = \frac{1}{27}}$

6) a) $h(x) = f(g(x)) - 6$
$h(x)$ is cont. $\rightarrow$ IVT applies

$h(1) = f(g(1)) - 6$
$= f(2) - 6 = 3 > -5$

$h(3) = f(g(3)) - 6$
$= f(4) - 6 = -7 < -5$

$h(r) = -5$ in $1 < r < 3$

b) $g^{-1}(2) = 1$ $\quad g'(1) = 5$

$(g^{-1})'(2) = \frac{1}{5}$

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