__Day 1:1__. $f(x) = \frac{6-x}{7}$, $g(x) = -7x+6$.

$$f(g(x)) = \frac{6-g(x)}{7} = \frac{6-(-7x+6)}{7} = x.$$

$$g(f(x)) = -7f(x)+6 = -7\left(\frac{6-x}{7}\right)+6$$

$$= -6+x+6$$

$$= x.$$

__Day 1:3__ $f^{-1}(f(x)) = x$

$$\Rightarrow \frac{d}{dx}\left[f^{-1}(f(x))\right] = 1$$

$$\Rightarrow (f^{-1})'(f(x))\,f'(x) = 1$$

$$\Rightarrow (f^{-1})'(f(x)) = \frac{1}{f'(x)}$$

The geometric meaning is the slope of the tangent line.

__Day 1:4__

(a) $f(x) = x^5 + x^3 + x$,

$f^{-1}(3) = 1$

$f(f^{-1}(2)) = 2$

$$(f^{-1})'(3) = \frac{1}{f'(f^{-1}(3))} = \frac{1}{f'(1)} = \frac{1}{5(1)^4+3(1)^2+1}$$

$$= \frac{1}{9}$$

Day 1: 4 ~~cont~~ ..

(b) $f(x) = 3\sin(x) + 2\cos(x) + x^3$,

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

$$= \frac{1}{f'(0)} \quad \text{since } f^{-1}(2) = 0$$

$$= \frac{1}{3\cos(0) - 2\sin(0) + 3(0)^2} = \frac{1}{3}.$$

(c) $f(x) = \int_3^x \sqrt{1+t^3}\,dt$, $\cancel{f^{-1}(0)}$

$f^{-1}(0) = 3$ since $\int_3^3 \sqrt{1+t^3}\,dt = 0$

$$(f^{-1})'(0) = \frac{1}{f'(f^{-1}(0))}$$

$$= \frac{1}{f'(3)}$$

$$= \frac{1}{\sqrt{1+(3)^3}} = \frac{1}{\sqrt{28}}$$

Day 2: 2:

(work not shown)

(a) $\lim_{x\to\infty} \frac{e^{2x}-e^{-2x}}{e^{2x}+e^{-2x}} = 1$

(b) $\lim_{x\to-\infty} \frac{e^{2x}-e^{-2x}}{e^{2x}+e^{-2x}} = -1$

(c) $\lim_{x\to\infty} e^{-2x}\cos(x) = 0$

(d) $\lim_{x\to\infty} (1.0001)^x = \infty$

(e) $\lim_{x\to(\frac{\pi}{2})^+} e^{\tan(x)} = \lim_{y\to-\infty} e^y = 0$

(f) $\lim_{x\to-\infty} (1.0001)^x = 0$

(g) $\lim_{x\to 0^+} 2^{1/x} = \infty$

(h) $\lim_{x\to 0^-} 2^{-1/x} = 0$