Problem 6:

Prove that f and g are inverse functions: $f(x) = 5x + 1$, $g(x) = \frac{x-1}{5}$

$f(g(x)) = 5\left(\frac{x-1}{5}\right) + 1$
$f(g(x)) = x - 1 + 1$
$f(g(x)) = x$
$g(f(x)) = \frac{(5x-1)+1}{5}$
$g(f(x)) = \frac{5x-1+1}{5}$
$g(f(x)) = \frac{5x}{5} = x$
$\therefore g(x)$ and $f(x)$ are inverse functions

Problem 44:

Determine whether the function is monotonic: $f(x) = (x + a)^3 + b$

$f'(x) = 3(x + a)^2 \geq 0$ for all values of x
$\therefore f(x)$is monotonic, and thus has an inverse function

Problem 48:

Determine whether the function is monotonic: $f(x) = |x + 2|$, [-2,∞]

$f'(x) = 1 \geq 0$ [-2,∞]
$\therefore f(x)$is monotonic, and thus has an inverse function

Problem 74:

Find $(f^{-1})'(a)$, if $f(x) = \frac{1}{27}(x^5 + 2x^3)$ and $a = -11$

$f'(x) = \frac{1}{27}(5x^4 + 6x^2) > 0$, $\therefore (f^{-1})$exists
$-11 = \frac{1}{27}(x^5 + 2x^3)$
$x = 17$
$\therefore f(x) = -11$ when $x = -3$
Theorem 5.9 states that $(f^{-1})'(x) = \frac{1}{f'(f^{-1}(x))}$
$(f^{-1})'(-3) = \frac{1}{f'(-3)}$
$(f^{-1})'(-3) = \frac{1}{\frac{1}{27}(-3^4 \times 5 + -3^2 \times 6)}$
$(f^{-1})'(-3) = 17$