

①

ASSIGNMENT #4
 201-009-50 C2
 SOLUTIONS

$$f(x) = x^2 + 1$$

$$g(a) = \frac{1}{a+1}$$

$$h(y) = y^2 - y$$

$$M(t) = \sqrt{t-1}$$

$$p(t) = 2t + 3$$

$$r(x) = \frac{x+1}{x^2}$$

① $f(3) = 3^2 + 1$
 $= \boxed{10}$

$$g(3) = \frac{1}{3+1} = \boxed{\frac{1}{4}}$$

$$h(3) = 3^2 - 3$$

$$= \boxed{6}$$

$$M(3) = \sqrt{3-1} = \boxed{\sqrt{2}}$$

$$p(3) = 2(3) + 3$$

$$= \boxed{9}$$

$$r(3) = \frac{3+1}{9} = \boxed{\frac{4}{9}}$$

② $f(x+1) = (x+1)^2 + 1$
 $= x^2 + x + x + 1 + 1$
 $= \boxed{x^2 + 2x + 2}$

$$g(x+1) = \frac{1}{x+1+1} = \boxed{\frac{1}{x+2}}$$

$$h(x+1) = (x+1)^2 - (x+1)$$

$$= x^2 + 2x + 1 - x - 1$$

$$= \boxed{x^2 + x}$$

③ $M(-y^2)$
 $= \boxed{\sqrt{-y^2 - 1}}$

$$p(-y^2) = \boxed{-2y^2 + 3}$$

$$r(-y^2) = \frac{-y^2 + 1}{(-y^2)^2} = \frac{-y^2 + 1}{y^4}$$

$$\begin{aligned}
(4) \quad & f(2) - 3g(4) + h(-1) \\
&= [2^2 + 1] - \left[3 \left(\frac{1}{4+1} \right) \right] + [(-1)^2 - (-1)] \\
&= 5 - \frac{3}{5} + 2 \\
&= 7 - \frac{3}{5} \\
&= \frac{35 - 3}{5} = \boxed{\frac{32}{5}}
\end{aligned}$$

$$\begin{aligned}
(5) \quad & \frac{M(2) - 5p(0)}{r(3)} = \frac{\sqrt{2-1} - 5(2(0)+3)}{\frac{3+1}{3^2}} \\
&= \frac{1 - 15}{\frac{4}{9}} = -14 \cdot \frac{9}{4} \\
&= \boxed{-\frac{63}{2}}
\end{aligned}$$

$$\begin{aligned}
(6) \quad & (p \circ M)(x) = p(M(x)) \\
&= p(\sqrt{x-1}) = \boxed{2\sqrt{x-1} + 3}
\end{aligned}$$

$$\begin{aligned}
(7) \quad & (g \circ r)(a) = g(r(a)) = g\left(\frac{a+1}{a^2}\right) = \frac{1}{\frac{a+1}{a^2} + 1} \\
&= \frac{1}{\frac{a+1+a^2}{a^2}} = \boxed{\frac{a^2}{a^2+a+1}}
\end{aligned}$$

$$\begin{aligned}
(8) \quad & (p \circ f)(y+1) = p(f(y+1)) \\
&= p((y+1)^2 + 1) = p(y^2 + 2y + 2) \\
&= 2(y^2 + 2y + 2) + 3 = \boxed{2y^2 + 4y + 7}
\end{aligned}$$