(Exercise . 1.2) Q-(5-10)

Date .....

"Composite of functions"

Q5. If $f(x) = x+5$ and $g(x) = x^2 - 3$, find the following:

a) $f(g(0))$

Sol,

$f(g(0))$

$g(x) = x^2 - 3$

$f(x) = x + 5$

$f(g(0)) = f(x^2 - 3)$

$= f(0)^2 - 3)$

$= f(-3)$

$= x + 5$

$= -3 + 5$

$= \boxed{2}$

b) $g(f(0))$

Sol:

$g(f(0))$

$g(x) = x^2 - 3$

$f(x) = x + 5$

$g(f(0)) = g(0+5)$

$= g(5)$

$= x^2 - 3$

$= (5)^2 - 3$

$= 25 - 3$

$= \boxed{22}$

c) $f(g(x))$

Sol.

$f(g(x))$

$f(x^2 - 3)$

$= x^2 - 3 + 5$

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

d) $g(f(x))$

Sol,

$g(f(x))$

$= g(x+5)$

$= (x+5)^2 - 3$

$= x^2 + 10x + 25 - 3$

$= \boxed{x^2 + 10x + 22}$

e) $f(f(-5))$

$f(x) = (x+5)$

$f(-5+5)$

$f(0)$

$0+5$

$\boxed{5}$

f) $g(g(2))$

$g(x) = x^2 - 3$

$g(2)^2 - 3)$

$g(4-3)$

$g(1)$

$1-3$

$\boxed{-2}$

g) $f(f(x))$

$f(x) = x+5$

$f(x+5)$

$x+5+5$

$\boxed{x+10}$

Date .....

Q6: If $f(x) = x-1$ and $g(x) = 1/(x+1)$, find the following:

a) $f(g(1/2))$

Sol:

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

$f\left(\frac{1}{\frac{1}{2}+1}\right)$

$f\left(\frac{1}{\frac{3}{2}}\right)$

$f\left(\frac{2}{3}\right)$

$\frac{2}{3} - 1$

$\frac{2-3}{3}$

$\boxed{-\frac{1}{3}}$

b) $g(f(1/2))$

Sol:

$g(f(1/2))$

$f(x) = x-1$

$g\left(\frac{1}{2}-1\right)$

$g\left(\frac{-1}{2}\right)$

$\frac{1}{-\frac{1}{2}+1}$

$\frac{1}{1/2} \Rightarrow \boxed{2}$

c) $f(g(x))$

Sol:

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

$f\left(\frac{1}{x+1}\right)$

$\frac{1}{x+1} - 1$

$\frac{1-1(x+1)}{(x+1)}$

$\frac{1-x-1}{x+1}$

$\boxed{\frac{-x}{x+1}}$

d) $g(f(x))$

Sol:

$f(x) = x-1$

$g(f(x))$

$g(x-1)$

$\frac{1}{x-1+1}$

$\boxed{\frac{1}{x}}$

e) $f(f(2))$

$f(x) = x-1$

$f(2-1)$

$f(1)$

$1-1 \Rightarrow \boxed{0}$

f) $g(g(2))$

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

$g\left(\frac{1}{2+1}\right)$

$g\left(\frac{1}{3}\right)$

$\frac{1}{\frac{1}{3}+1}$

$\boxed{\frac{3}{4}}$

g) $f(f(x))$

Sol:

$f(x) = x-1$

$f(x-1)$

$(x-1)-1$

$\boxed{x-2}$

h) $g(g(x))$

Sol:

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

$g\left(\frac{1}{x+1}\right)$

$\frac{1}{\frac{1}{x+1}+1}$

$\frac{1}{\frac{x+2}{x+1}}$

$\boxed{\frac{x+1}{x+2}}$

In Q 7-10, write formula for fogoh.

7) $f(x) = x+1$, $g(x) = 3x$, $h(x) = 4-x$

Sol:

$fogoh = f(g(h(x)))$

As we know,

$= f(g(4-x))$

$= f(3(4-x))$

$= f(12-3x)$

$= (12-3x)+1$

$= 12-3x+1$

$= \boxed{13-3x}$

8) $f(x) = 3x+4$

$g(x) = 2x-1$

$h(x) = x^2$

Sol,

$fogoh = f(g(h(x)))$

As we know,

$= f(g(x^2))$

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

$= 3(2x^2-1)+4$

$= 6x^2-3+4$

$= \boxed{6x^2+1}$

9) $f(x) = \sqrt{x+1}$

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

$h(x) = \frac{1}{x}$.

Sol,

$fogoh = f(g(h(x)))$

$= f(g(\frac{1}{x}))$

$= f(\frac{1}{\frac{1}{x}+4})$

$= f(\frac{1}{\frac{1+4x}{x}})$

$= f(\frac{x}{1+4x})$

$= \sqrt{\frac{x}{1+4x}+1}$

$= \sqrt{\frac{x+1+4x}{1+4x}}$

$= \boxed{\sqrt{\frac{5x+1}{4x+1}}}$

10) $f(x) = \frac{x+2}{3-x}$, $g(x) = \frac{x^2}{x^2+1}$, $h(x) = \sqrt{2-x}$

$fogoh = f(g(h(x)))$

$f(g(\sqrt{2-x}))$

$f(\frac{(\sqrt{2-x})^2}{(\sqrt{2-x})^2+1})$

$f(\frac{2-x}{2-x+1})$

$f(\frac{2-x}{3-x})$

$\frac{\frac{2-x}{3-x}+2}{3-\frac{2-x}{3-x}}$

$\frac{2-x+6-2x}{3-x}$

$\frac{9-3x-2+x}{3-x}$

$\frac{2-x+6-2x}{9-3x-2+x}$

$\frac{8-3x}{7-2x}$

$\boxed{\frac{8-3x}{7-2x}}$