

1) Given the line $y = -\frac{2}{3}x + 4$, write an equation in **point-slope form** for the line through $(6, -1)$ that is

$$y - y_1 = m(x - x_1)$$

a) Parallel to the given line (2 pts)

$$y + 1 = -\frac{2}{3}(x - 6)$$

b) Perpendicular to the given line (2 pts)

$$y + 1 = \frac{3}{2}(x - 6)$$

2) Write the equation of the line that is perpendicular to the x-axis and passes through the point $(-4, 7)$

$$x = -4$$

3) Let $f(x) = 2 - x$ and $g(x) = 3 - x^2$. Find the formula and simplify for:

a) $g(f(x))$

$$\begin{aligned} &= 3 - (2 - x)^2 \\ &= 3 - (4 - 4x + x^2) \\ &= 3 - 4 + 4x - x^2 \\ &= \boxed{-1 + 4x - x^2} \end{aligned}$$

b. $\frac{g(x+h) - g(x)}{h}$

$$\begin{aligned} &\frac{3 - (x+h)^2 - (3 - x^2)}{h} \\ &= \frac{3 - (x^2 + 2xh + h^2) - 3 + x^2}{h} \\ &= \frac{3 - x^2 - 2xh - h^2 - 3 + x^2}{h} \\ &= \frac{-2xh - h^2}{h} \\ &= \frac{h(-2x - h)}{h} \\ &= \boxed{-2x - h} \end{aligned}$$

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

$$\begin{aligned} &= 3 - (9 - 6x^2 + x^4) \\ &= 3 - 9 + 6x^2 - x^4 \\ &= \boxed{-6 + 6x^2 - x^4} \end{aligned}$$

4) Use the table below to fill in the blanks.

x	f(x)	g(x)	h(x)
-1	3	0	-6
0	-2	3	1
1	8	2	-1
2	0	-3	5
3	1	2	0

a. $g(f(2)) = \underline{3}$

$g(0)$

b. $f(h(0)) = \underline{8}$

$f(1)$

c. $h(h(f(3))) = \underline{-6}$

$h(h(1))$

$h(-1)$

5. Simplify:

$$\text{a. } \frac{\left(3 - \frac{5}{x+1}\right) (x+1)}{\left(4 + \frac{10}{x+1}\right) (x+1)}$$

$$\frac{3(x+1) - 5}{4(x+1) + 10}$$

$$\frac{3x+3-5}{4x+4+10}$$

$$\boxed{\frac{3x-2}{4x+14}}$$

$$\text{b. } \frac{\left(4 + \frac{x}{2x+1}\right) (2x+1)}{2 - \frac{1}{2x+1} (2x+1)}$$

$$\frac{4(2x+1) + x}{2(2x+1) - 1}$$

$$\frac{8x+4+x}{4x+2-1}$$

$$\boxed{\frac{9x+4}{4x+1}}$$

6. Determine if the function has a vertical and/or horizontal asymptotes and determine the equation of them.

$$\text{a. } f(x) = \frac{3x-1}{3x^2+2x-1}$$

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

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

horizontal $y=0$
vertical $x=-1$

$$\text{b. } f(x) = \frac{5x^2}{3x^2-x}$$

$$= \frac{5x^2}{x(3x-1)}$$

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

horizontal ~~$y=0$~~ $y=5/3$
vertical $x=1/3$

$$\text{c. } f(x) = \frac{4x^2-1}{x-1}$$

no horizontal
vertical $x=1$