[ ] Find functions f and g such that $(f \circ g)(x) = \sqrt[3]{x^2 - 4}$.
(NOTE: Neither f nor g should be the function x.)

ANSWER: $f(x) =$ $\sqrt[3]{x}$

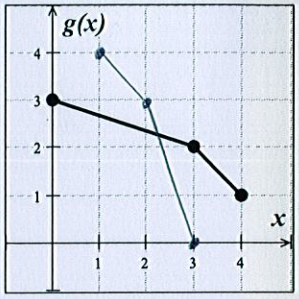
$g(x) =$ $x^2 - 4$

[ ] The graph of g is shown on the right. Sketch the graph of g^{-1} on the same axes.

$(0,3) \longrightarrow (3,0)$
$(3,2) \longrightarrow (2,3)$
$(4,1) \longrightarrow (1,4)$

ANSWER:

(2)



[ ] If $f(x) = x^2 + 1$ and $g(x) = x - 4$, find $(\frac{f}{g})(-1) - g(3)$.

ANSWER: $\frac{3}{5}$

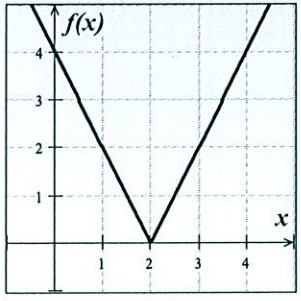
$\frac{f(-1)}{g(-1)} - g(3) = \frac{2}{-5} - -1 = -\frac{2}{5} + 1 = \frac{3}{5}$

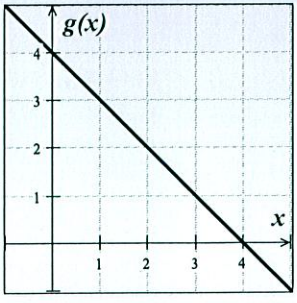
[ ] Find a mathematical model for the statement
"z is jointly proportional to the square of x and the cube of y".

ANSWER: $z = kx^2y^3$

[ ] Use the graphs of f and g below to evaluate $(g \circ f)(2)$.

ANSWER: 4





$g(f(2)) = g(0) = 4$

ADDITIONAL QUESTIONS ON THE OTHER SIDE ➡

[ ] Let $f(x)=\dfrac{x-3}{x+2}$.

[a] Find $f^{-1}(x)$. **ANSWER:** $\dfrac{2x+3}{1-x}$

$y=\dfrac{x-3}{x+2}$

$x=\dfrac{y-3}{y+2}$ (½)

$xy+2x=y-3$

$2x+3=y-xy$

$2x+3=y(1-x)$

$y=\dfrac{2x+3}{1-x}$

$f^{-1}(x)=\dfrac{2x+3}{1-x}$

[b] Find the range of f. Write your answer in interval notation. **ANSWER:** $(-\infty,1)\cup(1,\infty)$

DOMAIN OF f^{-1}

$1-x\neq 0$

$x\neq 1$

[ ] For cylindrical cans of a fixed volume, the height of the can varies inversely with the square of its radius. If a can with a radius of 2 inches is 6 inches tall, find the radius of a can which is 8 inches tall. **ANSWER:** $\sqrt{3}$ INCHES

h = HEIGHT OF CAN (INCHES)

r = RADIUS OF CAN (INCHES)

$h=\dfrac{k}{r^2}$

$6=\dfrac{k}{2^2}$

$k=24$

$h=\dfrac{24}{r^2}$

$8=\dfrac{24}{r^2}$ (½)

$8r^2=24$

$r^2=3$

$r=\sqrt{3}$

[ ] The number N of bacteria in a certain food is given by $N(T)=10T^2-20T+600$, where T is the temperature of the food in degrees Celsius. When the food is removed from refrigeration, the temperature of the food is given by $T(t)=3t+2$ degrees Celsius, where t is the time in hours.

[a] Find $N(T(t))$. **ANSWER:** $90t^2+60t+600$

$N(T(t))=10(3t+2)^2-20(3t+2)+600$

$=10(9t^2+12t+4)-60t-40+600$ (½)

$=90t^2+120t+40-60t-40+600$

$=90t^2+60t+600$ (½)

[b] Interpret the meaning of $N(T(t))$ in context.

ANSWER: THE NUMBER OF BACTERIA t HOURS AFTER THE FOOD IS REMOVED FROM REFRIGERATION