Let $f(x) = x^3 - x^2 - 2x$, $g(x) = x + 3$, and $k(x) = 3x$

1. Let $h(x) = k(\, f(x)\,)$
   (a) Give the formula for $h(x)$
   (b) Plot $y = h(x)$ and $y = f(x)$ on the same set of axes
   (c) How is the graph of $y = h(x)$ related to the graph of $y = f(x)$?

2. (i) Repeat #1 for $h(x) = f(\, k(x)\,)$
   (ii) Repeat #1 for $h(x) = g(\, f(x)\,)$
   (iii) Repeat #1 for $h(x) = f(\, g(x)\,)$

3. Explain how the graphs are related to the graph of $y = f(x)$
   (a) $y = f(x) + a$
   (b) $y = f(x + a)$
   (c) $y = a\, f(x)$
   (d) $y = f(a\, x)$

Remember $f(x) = x^3 - x^2 - 2x$, $\quad g(x) = x + 3$, **and** $\quad k(x) = 3x$

4. Use the plot of $y = f(x)$ to answer these questions
   (a) What are the roots of f? (i.e., For which x-values is $f(x) = 0$?)
   (b) For which x-values is f increasing? decreasing?
   (c) What are the x-values where f has local maxes? mins?
   (d) What are the x-values where f is concave up? concave down?

5. Repeat #4 for $h(x) = k(f(x))$

6. Repeat #4 for $h(x) = g(f(x))$

7. Repeat #4 for $h(x) = f(g(x))$

8. Repeat #4 for $h(x) = f(k(x))$