Problem 1

Consider the following functions.

(a) $f(x) = \sin(x)$

(b) $f(x) = (1/x)$

(c) $f(x) = \sqrt{(}x - 1)$

There is a pattern in the derivatives of these function. We will discover and establish it.

a Compute the first, second, and third derivative of each of these functions.

b Propose a general formula for $f^{(n)}(x)$. This will be interms of n.

c Verify the proposed formula in two steps. Step 1 - verify the formula when $n = 1$. Step 2- assuming formula is true for a certain value of n, let us say for $n = k$, show that formula is valid for the next value of $n = k + 1$.

Problem 2 Suppose that $f(x)$ and $g(x)$ are differentiable functions, and the following information is known about them:

$$f(2) = -3 \qquad f'(2) = 5 \qquad g(2) = 1 \qquad g'(2) = 2 \qquad g(0) = 2 \qquad g'(0) = 4$$

a) If $F(x) = \dfrac{f(x)}{g(x)}$, compute $F(2)$ and $F'(2)$.

b) If $G(x) = x^3 f(x) - 7g(x)$, compute $G(2)$ and $G'(2)$.

c) If $H(x) = \dfrac{3 + e^x}{g(x)}$, compute $H(0)$ and $H'(0)$.