(1) Compute the first derivative of the following functions:

$$f(x) = 3x\,e^{x^2} + 2\,sec\,x \qquad\qquad g(x) = \frac{2x}{\sqrt{1+3\,ln\,x}}$$

Don't bother to simplify the answers.

(2) Compute the following integrals:

$$\int x\,sin\,3x\,dx \qquad\qquad \int_1^2 \frac{3}{2-2\,x+x^2}\,dx$$

$$\int \frac{sec^2\,x}{1+tan\,x}\,dx$$

(3) Compute the derivative of $f(x) = \frac{1}{x}$ using the definition of the derivative.

(4) Approximate the value of $ln\,x$ when $x = e^2 - 0.001$.

(5) Find the area of the bounded region between $y = x^3 - x$ and $y = x^2 - 1$.

(6) Without evaluating the integral, calculate the derivative of

$$F(x) = \int_0^{3x} (1-t^2)\,dt$$

where is $F(x)$ increasing? decreasing? Does it have any local maxima? Where is it concave up/down?