Mathematics Assessment Paper 1

1. If $f(x) = x^2$ and $g(x) = 1/(x-1)$, with $x > 1$, find: $F(g(x))$

2. Calculate: $g''(0)$, where $g(t) = a\cos(3t) + b\sin(3t)$
   (and a and b are constants)

3. Find the derivative of: $g(t) = \cos(e^{2t+1})$

4. Find the following indefinite integrals:
   a) $\int (\sin\theta - \cos\theta)\, d\theta$
   b) $\int (x+3)(x-2)\, dx$

5. Find the integral $\int x^2 \ln x\, dx$

6. Write the quadratic $x^2 - 8x + 2$ in completed square form

7. write the expression $3\ln 6 - 2\ln 2$ as the logarithm of a single number

8. Subtracting vectors in component form:

   Let a $= 5i - 2j$ and b $= -I + 3j$. Find a $-$ b

9. Find the stationary points of the function $f(x) = 2x^3 - 3x^2 - 36x$

10. If A$= \begin{pmatrix} 2 & 2 & -1 \\ 3 & 5 & 1 \\ 1 & 2 & 1 \end{pmatrix}$ evaluate det A

11. Find the general solution of the differential equation:

$$\frac{dy}{dx} = xe^{-2x}$$