Name ________________________________

Student number ______________________

Each part of each problem is worth one point, for a total of ten points. There is no partial credit. You have twenty-five minutes for this test. If you find a problem takes more than a minute or two, move on to something else and come back to it later.

1. Put \( \sin(2t) + \sqrt{3}\cos(2t) \) in the form \( A\sin(Bt + C) \). Recall that \( \sin(\theta + \phi) = \sin(\theta)\cos(\phi) + \cos(\theta)\sin(\phi) \). It may also be useful to remember that a \( 30^\circ - 60^\circ - 90^\circ \) triangle has sides 1, \( \sqrt{3} \), and 2 (though in your formula all angles must be in radians).

\[
2\sin(2t + \frac{\pi}{3})
\]

2. Solve the following expression for \( y \):

\[
\ln(xy) - \ln(x^2) = x + 3, \text{where } x > 0 \text{ and } y > 0.
\]

\[
y = xe^{x+3}
\]

3. Simplify the following expression:

\[
\frac{B+A}{B-A} , \text{ where } A, B \text{ are non-zero real numbers.}
\]

\[
\frac{1}{B-A}
\]

4. Find all values of \( x \) for which \( x^3 - 5x^2 + 6x = 0 \)

\[
x = 0, 2, \text{ or } 3
\]

5. Find all values of \( x \) for which \( x^2 + 5x - 6 = 0 \)

\[
x = 1 \text{ or } -6
\]

6. \[
\int 2xe^{x^2} \, dx = e^{x^2} + C
\]

7. \[
\int 2xe^{2x} \, dx = xe^{2x} - \frac{1}{2}e^{2x} + C
\]

8. \[
\int \frac{x}{x+1} \, dx = x - \ln|x+1| + C
\]

9. \[
\int \frac{1}{x^2 + 1} \, dx = \tan^{-1}(x) + C
\]

10. \[
\int \frac{1}{x^2 - 1} \, dx = \frac{1}{2} \ln| x - 1 | - \frac{1}{2} \ln| x + 1 | + C
\]