### Verification type
Analytical Solutions

### Database reference
ANA-10

### Topic / Application
Analytical Solution

### Physics
- Navier-Stokes Equations
- Incompressible
- Compressible

### Summary
This test case exercises the terms in the Navier-Stokes equations

### Description
This reference gives an analytical solution to the Navier-Stokes equations,

**Case Title**
2D Analytical Solution to Navier-Stokes, via a combination of sin and cosine terms for the velocity and pressure fields.

With viscosity set to zero, the test is of the advective discretization and the time integration terms.

Solutions with viscosity are also tested.

Note that Elsewhere in the document a compressible version of the NS equations is also verified with an analytical solution and is a test of the continuity equation.

### Authors
Randall McDermott, Kevin McGrattan, Simo Hostikka, Jason Floyd

### Year
2010

### Online reference
NIST Special Publication 1018-5

### Case image
![Image above shows the velocity field. Below are the results of the grid convergence study for both viscous and non-viscous cases showing 2nd order accuracy.](image-url)
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<table>
<thead>
<tr>
<th>Governing equations</th>
<th>Refer to document.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results</td>
<td>It is shown that the solutions for both non-viscous and viscous terms are solved to 2nd order accuracy with grid spacing</td>
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