Powerful Tests

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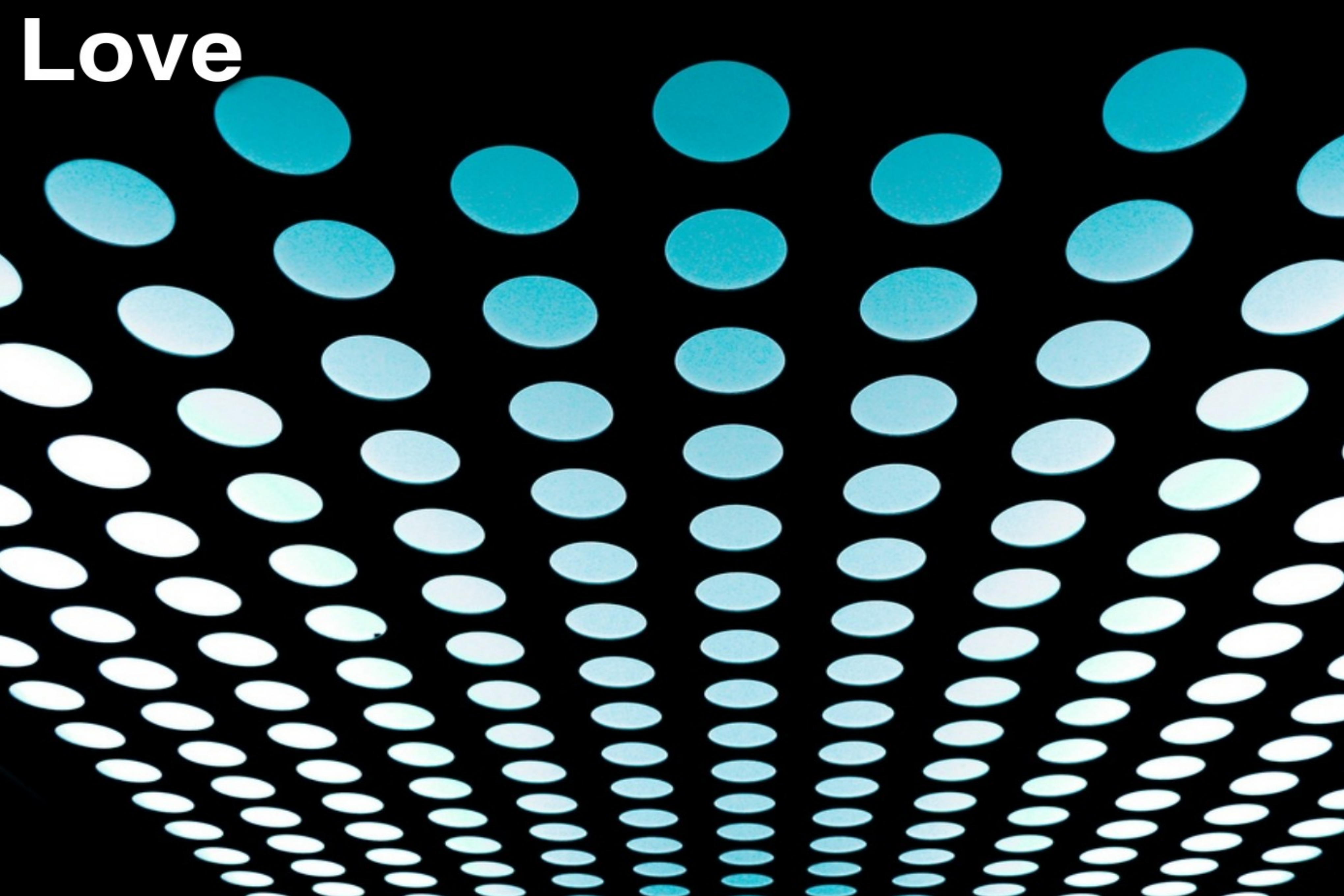
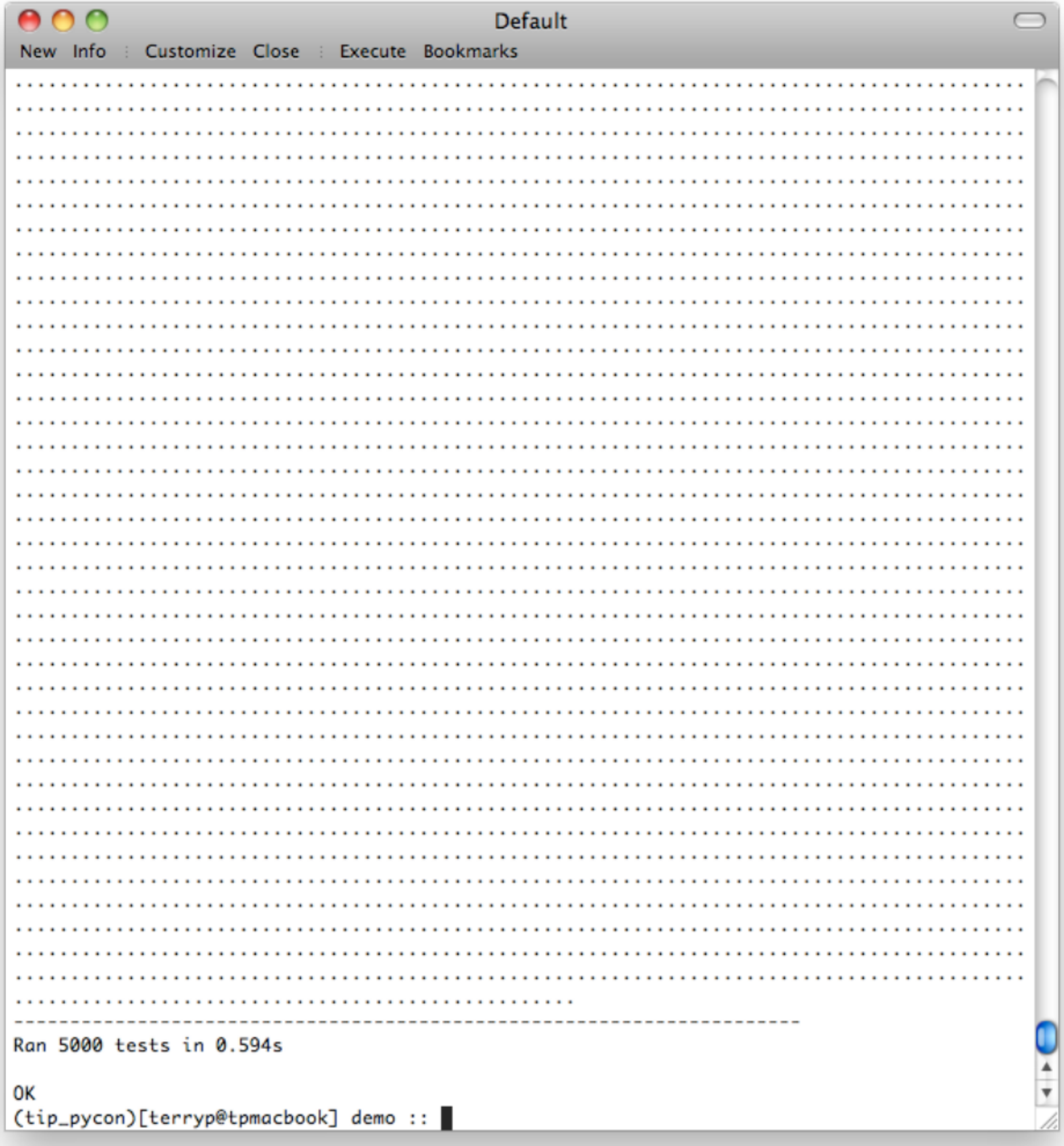
“I'm addicted to dots. If you don't know what that means, you need to write (or run) more unit tests.”

Chad Whitacre
PyCon 2007 - Dallas

Love





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----------------------------------------------------------------------
Ran 5000 tests in 0.594s

OK
(tip_pycon)[terryp@tpmacbook] demo :: 
```

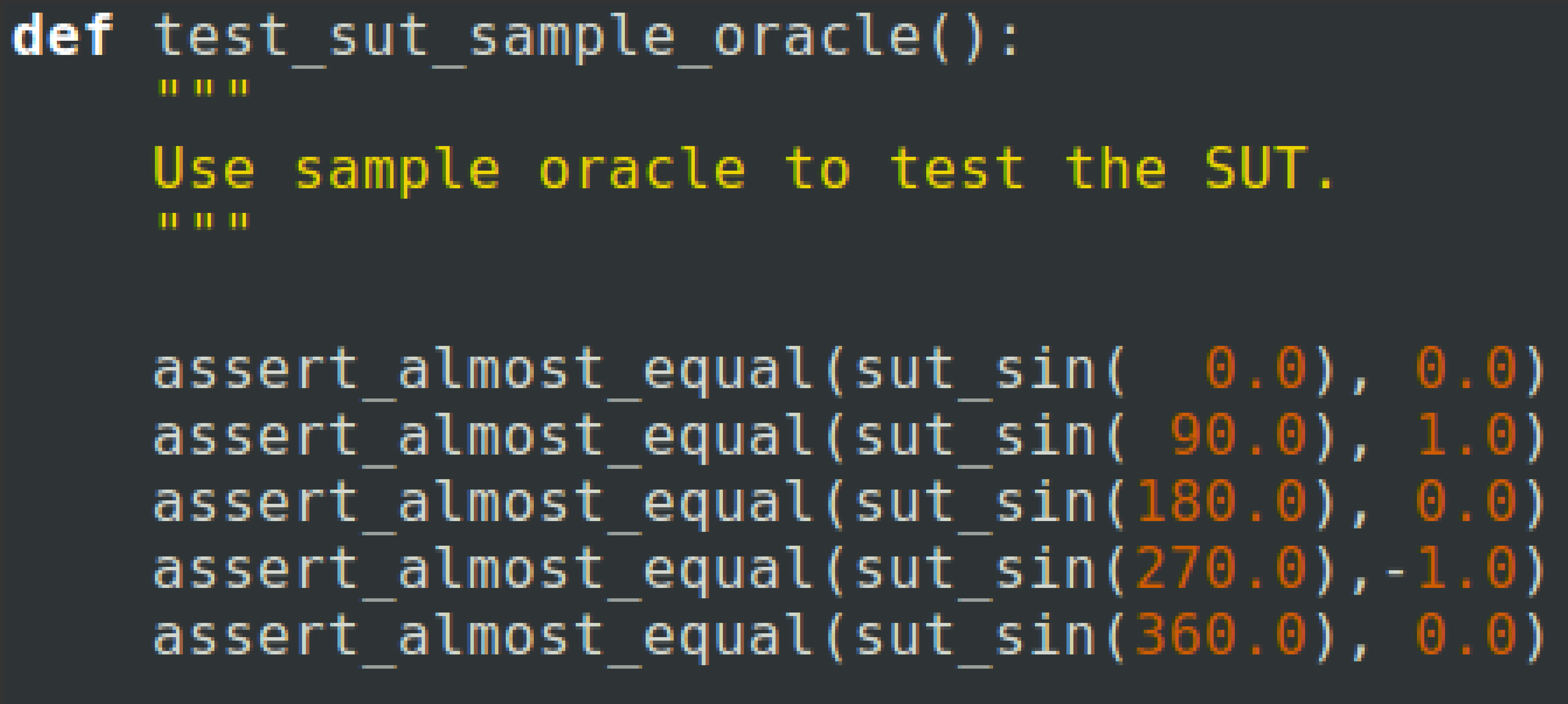
TROUBLE AHEAD

5 “Approaches” to Unit-tests:

	TRUE ORACLE	HEURISTIC ORACLE	SAMPLING ORACLE	CONSIST. ORACLE	NO ORACLE
	Indep. generation of all expected results	Verify few values plus consistency of remaining values	Provide collection of inputs and results	Verify current with previous run	Results not verified!
+	No undetected errors	Faster and easier Less expensive	Very easy to start from manual test.	Fast Straightfwd. Large data amounts	Run any amount of data
–	Expensive Complex Time consuming	Can miss systematic errors	trains software to pass the test	Original run may already contain errors	Only crashes are noticed

After Douglas Hoffman, “Heuristic Test Oracles, 1999

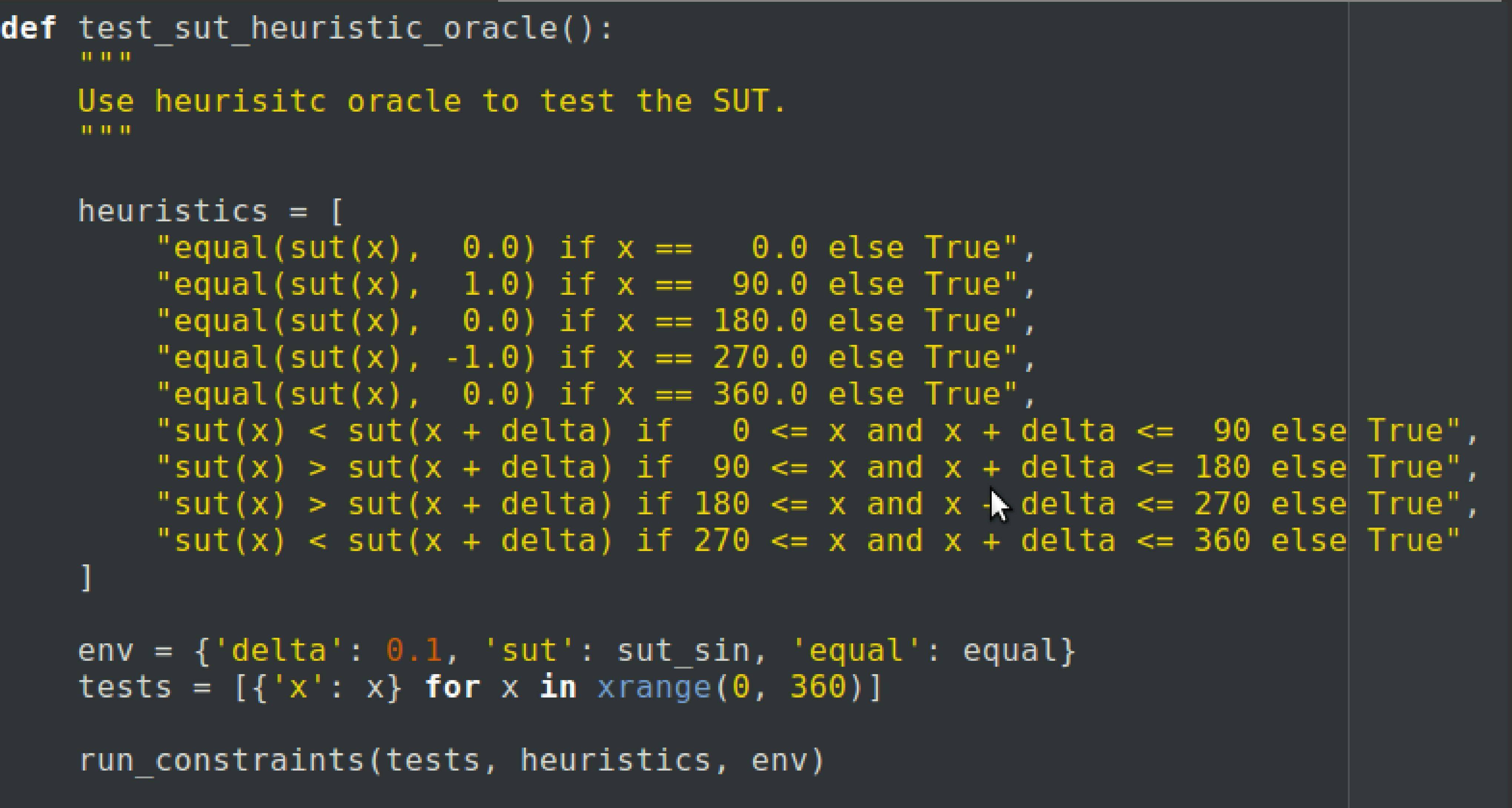
SAMPLE ORACLE



```
def test_sut_sample_oracle():
    """
    Use sample oracle to test the SUT.
    """

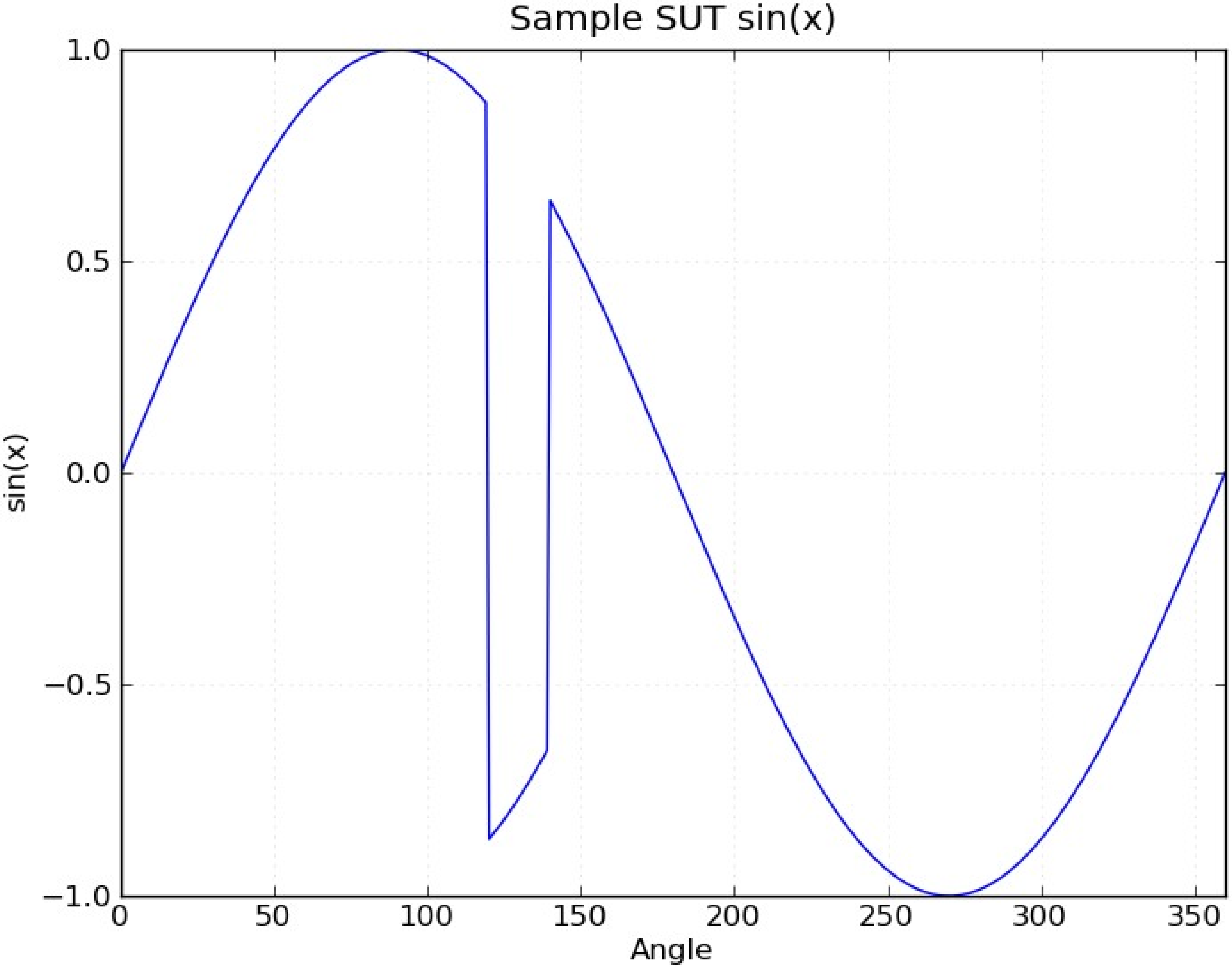

    assert_almost_equal(sut_sin(  0.0), 0.0)
    assert_almost_equal(sut_sin( 90.0), 1.0)
    assert_almost_equal(sut_sin(180.0), 0.0)
    assert_almost_equal(sut_sin(270.0),-1.0)
    assert_almost_equal(sut_sin(360.0), 0.0)
```

HEURISTIC ORACLE

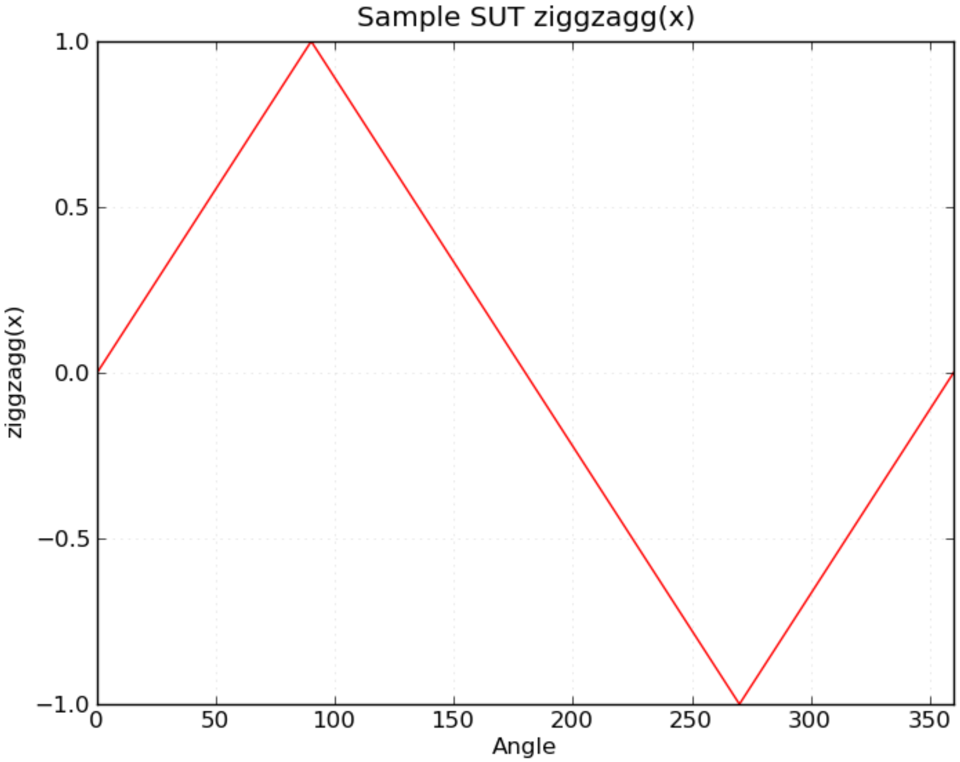


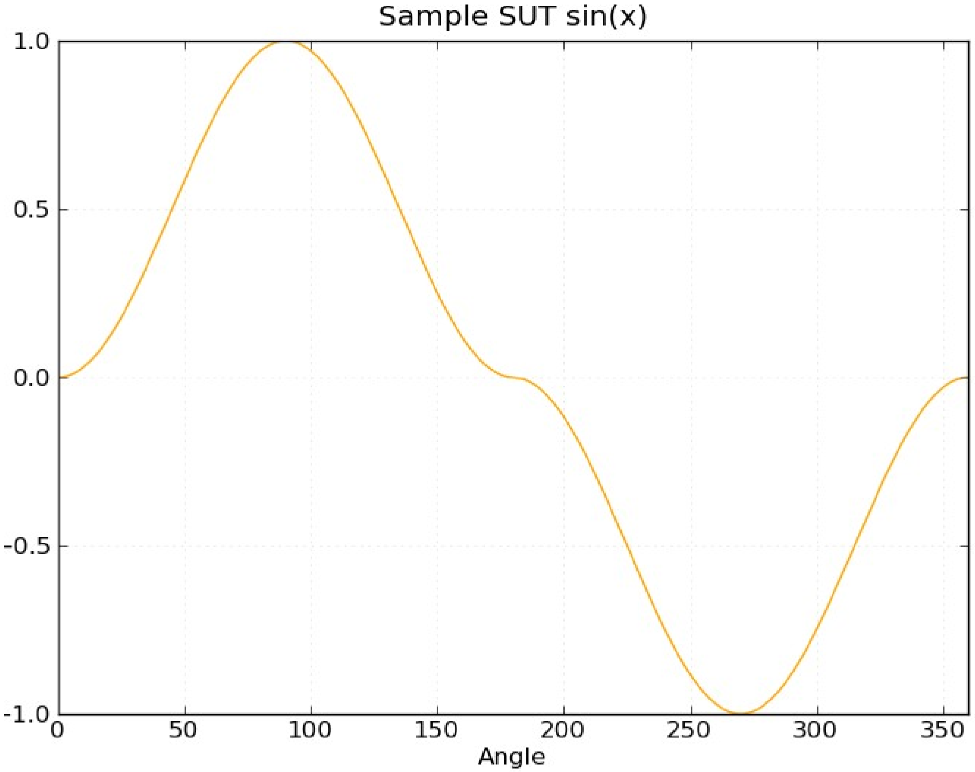
```python
def test_sut_heuristic_oracle():
    """
    Use heurisitc oracle to test the SUT.
    """

    heuristics = [
        "equal(sut(x),  0.0) if x ==   0.0 else True",
        "equal(sut(x),  1.0) if x ==  90.0 else True",
        "equal(sut(x),  0.0) if x == 180.0 else True",
        "equal(sut(x), -1.0) if x == 270.0 else True",
        "equal(sut(x),  0.0) if x == 360.0 else True",
        "sut(x) < sut(x + delta) if   0 <= x and x + delta <=  90 else True",
        "sut(x) > sut(x + delta) if  90 <= x and x + delta <= 180 else True",
        "sut(x) > sut(x + delta) if 180 <= x and x + delta <= 270 else True",
        "sut(x) < sut(x + delta) if 270 <= x and x + delta <= 360 else True"
    ]

    env = {'delta': 0.1, 'sut': sut_sin, 'equal': equal}
    tests = [{'x': x} for x in xrange(0, 360)]

    run_constraints(tests, heuristics, env)
```

HEURISTIC ORACLE finds this:



… but not these:





MORE INFO

Heuristic Oracles:

http://www.softwarequalitymethods.com/Papers/STQE%20H

My Website:

www.testing-software.org

Discussion/ Questions/ Features/ Bugs:

http://groups.google.com/group/testing-software-org/

Thanks!

www.petsy-fink.com