**Code:**

% Machine Problem 6 by Nicholas Fong on 3/11/17

% y" = 3y' + x^2

% y' = z

% z' = 3z + x^2

% y(0) = 1, z(0) = 2. Find y(2) using step size h = 0.05

% initialize variables

i = 0;

x = 0;

y = 1;

z = 2;

h = 0.05;

% Use 4th order Runge-Kutta method

while i < 41

fprintf("Step %d: x = %f, y = %f\n", i, x, y);

y1 = z;

z1 = x^2 + 3\*z;

y2 = z + h\*z1/2;

z2 = x^2 + 3\*(z + h\*z1/2);

y3 = z + h\*z2/2;

z3 = x^2 + 3\*(z + h\*z2/2);

y4 = z + h\*z3;

z4 = x^2 + 3\*(z + h\*z3);

y = y + h\*(y1 + 2\*y2 + 2\*y3 + y4)/6;

z = z + h\*(z1 + 2\*z2 + 2\*z3 + z4)/6;

x = x + h;

i++;

end;

**Output:**

Step 0: x = 0.000000, y = 1.000000

Step 1: x = 0.050000, y = 1.107889

Step 2: x = 0.100000, y = 1.233241

Step 3: x = 0.150000, y = 1.378897

Step 4: x = 0.200000, y = 1.548167

Step 5: x = 0.250000, y = 1.744915

Step 6: x = 0.300000, y = 1.973641

Step 7: x = 0.350000, y = 2.239587

Step 8: x = 0.400000, y = 2.548858

Step 9: x = 0.450000, y = 2.908559

Step 10: x = 0.500000, y = 3.326958

Step 11: x = 0.550000, y = 3.813678

Step 12: x = 0.600000, y = 4.379908

Step 13: x = 0.650000, y = 5.038666

Step 14: x = 0.700000, y = 5.805085

Step 15: x = 0.750000, y = 6.696765

Step 16: x = 0.800000, y = 7.734166

Step 17: x = 0.850000, y = 8.941072

Step 18: x = 0.900000, y = 10.345131

Step 19: x = 0.950000, y = 11.978477

Step 20: x = 1.000000, y = 13.878461

Step 21: x = 1.050000, y = 16.088488

Step 22: x = 1.100000, y = 18.659003

Step 23: x = 1.150000, y = 21.648629

Step 24: x = 1.200000, y = 25.125489

Step 25: x = 1.250000, y = 29.168743

Step 26: x = 1.300000, y = 33.870376

Step 27: x = 1.350000, y = 39.337274

Step 28: x = 1.400000, y = 45.693632

Step 29: x = 1.450000, y = 53.083759

Step 30: x = 1.500000, y = 61.675330

Step 31: x = 1.550000, y = 71.663171

Step 32: x = 1.600000, y = 83.273650

Step 33: x = 1.650000, y = 96.769781

Step 34: x = 1.700000, y = 112.457159

Step 35: x = 1.750000, y = 130.690844

Step 36: x = 1.800000, y = 151.883374

Step 37: x = 1.850000, y = 176.514061

Step 38: x = 1.900000, y = 205.139799

Step 39: x = 1.950000, y = 238.407622

Step 40: x = 2.000000, y = 277.069286