ME 1020 Engineering Programming with MATLAB

Problem 9.1:

1.* An object moves at a velocity $v(t) = 5 + 7t^2$ m/s starting from the position $x(2) = 5$ m at $t = 2$ s. Determine its position at $t = 10$ s.

First create an anonymous function for $v(t) = 5 + 7t^2$. The total distance traveled by an object moving at velocity $v(t)$ from time $t = a$ to $t = b$ is:

$$x(b) = \int_a^b v(t)dt + x(a)$$

For this problem, $a = 2,\ b = 10$ seconds. The position at $a = 2$ seconds is $x(t = 2) = 5.0$ meters:

$$x(10) = \int_2^{10} v(t)dt + x(2)$$

$$x(10) = \int_2^{10} (5 + 7t^2)dt + 5$$

$$x(10) = \left[5t + 7\left(\frac{t^3}{3}\right)\right]_2^{10} + 5$$

$$x(10) = \left\{\left[5(10) + 7\left(\frac{(10)^3}{3}\right)\right] - \left[5(2) + 7\left(\frac{(2)^3}{3}\right)\right]\right\} + 5 = 2359.\bar{6}$$

Problem 9.1

```
clear
clc
disp('Problem 9.1: Scott Thomas')

voft = @(t) (5 + 7*t.^2);
N = 100;
t = linspace(2,10,N);
v = voft(t);
plot(t,v), xlabel('t (sec)'), ylabel('v (m/s)')
title('Problem 9.1: Scott Thomas')

% Use numerical integration to evaluate the definite integral:

sum = 5.0;
for k = 1:N-1
    sum = sum + 1/2*(t(k+1) - t(k))*(v(k+1) + v(k));
end
sum
```

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Problem 9.1: Scott Thomas
sum =
   2.3597e+03
```