ME 350: A Quick Introduction to Vector Variables MATLAB

Create Vectors

"Manual"	`x = [1, 5, 9]`	Row vector
	`x = [1 5 9]`	Row vector, commas are optional
	`x = [1; 5; 9]`	Column vector
	`x = [1 5 9]'`	Column vector (notice the transpose)
Vector-creating function	`x = linspace(2,3)`	Row vector
	`x = linspace(-1,1)'`	Column vector (notice the transpose)
	`x = ones(1,3)`	Row vector
	`x = zeroes(10,1)`	Column vector
	`x = randn(10,1)`	Column vector
Colon notation	`x = 1:5`	Row vector of integers
	`x = 1:2:10`	Row vector, increments of 2
	`x = 0:0.1:10`	Row vector, increments of 0.1
Vector expressions	`x = 1:5`	Row vector of integers
	`y = sin(x)`	`y` is same "shape" as `x`

Access to Elements in a Vectors

After the `x` vector has been created, then

`x(1)`	is the first element of `x`
`x(3)`	is the third element of `x`
`x(end)`	is the last element of `x`
`i = ...; x(i)`	is the ith element of `x`
	`i` must be a positive integer $\leq$ `length(x)`

Expressions like `x(i)` can be used to retrieve a value from `x`

```
y = x(5);
```

as well as assign values to the elements of `x`

```
x(3) = sqrt( x(2) );
```

Other examples

`x(2) = 7.2`	stores 7.2 in the second element of `x`
`i=3; y(i) = x(i+1)`	stores the value of `x(4)` in `y(3)`.
`i=3; y(i) = sqrt(x(i+1))`	stores the square root of the value of `x(4)` in `y(3)`

Operations to Summarize or Extract Values from Vectors

After the `x` vector has been created, then

`n = length(x)`	`n` is the number of elements in `x`.
`xmax = max(x)`	`xmax` contains the element from `x` with largest positive value.
`xmin = min(x)`	`xmin` contains the element from `x` with either the smallest in magnitude positive value if all $x_i > 0$ or the most negative value in `x` if any $x_i < 0$.
`y = abs(x)`	creates a vector `y` such that $y_i = \|x_i\|$.
`xmax = max(abs(x))`	`xmax` contains the element from `x` with largest absolute value.
`xmin = min(abs(x))`	`xmin` contains the element from `x` with smallest absolute value.
`xbar = mean(x)`	`xbar` contains the average of the values in `x`.
`s = norm(x)`	`s` is the L_2 norm of elements in `x`. $s = \left[\sum_{i=1}^{n} x_i^2\right]^{1/2}$
`t = sum(x)`	`t` is the sum of the elements in `x`. $t = \sum_{i=1}^{n} x_i$
`u = sum(abs(x))`	`t` is the sum of the absolute value of elements in `x`. $u = \sum_{i=1}^{n} \|x_i\|$