

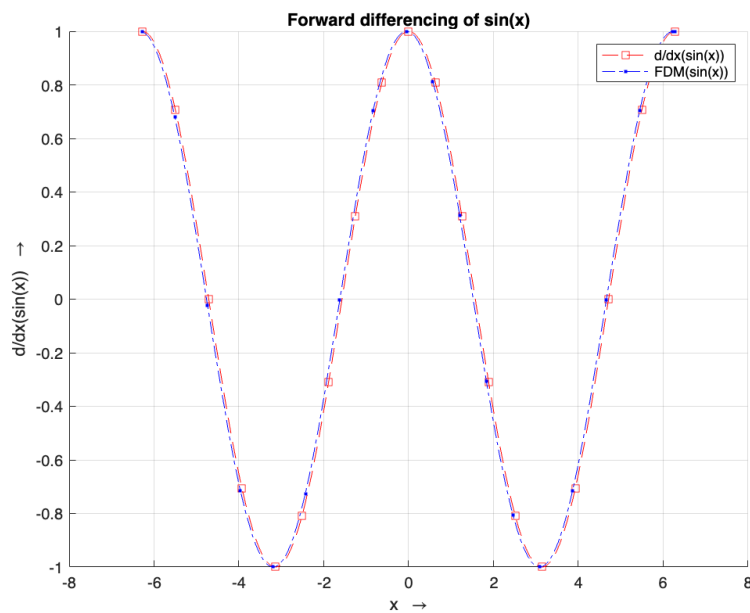
1.(a) Forward differencing of $\sin(x)$

We know that, forward difference of any function $f(x)$ is given by $f(x_0) = \frac{f(x_0 + \Delta x) - f(x_0)}{\Delta x}$

```
clear ALL;
clc;

syms x h; % initialize symbolic variables x and h (del_x we can't name as it contains `x` in it)
fx = sin(x);
diff_fx = diff(fx); % d/dx(sin(x))
fdm_fx = (subs(fx, x, x + h) - fx) / h; % applying forward difference approximation
% `subs` -> replace a value with a reqd. value within a fx
fdm_to_plot = subs(fdm_fx, h, 0.1); % more we reduce the value of h, more accuracy we'll get

figure;
hold ON;
fplot(diff_fx, [-2*pi 2*pi], 'red--'); % `fplot` -> plots function
fplot(fdm_to_plot, [-2*pi 2*pi], 'blue.-');
legend("d/dx(sin(x))", "FDM(sin(x))");
title("Forward differencing of sin(x)");
xlabel("x \rightarrow");
ylabel("d/dx(sin(x)) \rightarrow");
hold OFF;
grid ON;
```



NOTE: For required output of trigonometric functions, we've converted the unit of angles from degrees to radians.