

Hom #5 - Solutions

1/6.1
10P

$$z' = 5 - z, z(0) = 0$$

$$x_0 = 0, z_0 = 0, f(x, z) = 5 - z$$

k	x_k	z_k	$f(x_k, z_k) = 5 - z_k$	h	$f(x_k, z_k)h$
0	0.0	0.0000	5.0000	0.1	0.5000
1	0.1	0.5000	4.5000	0.1	0.4500
2	0.2	0.9500	4.0500	0.1	0.4050
3	0.3	1.3550	3.6450	0.1	0.3645
4	0.4	1.7195	3.2805	0.1	0.3281
5	0.5	2.0476	2.9524	0.1	0.2952

1/6.1

$$y' + 2xy = x, y(0) = 1$$

(ii) Solve it as a linear equation (or separable) to get

$$y(x) = \frac{1}{2} + \frac{15}{2} e^{-x^2}$$

(i), (iii) See the attached graph. (~~attached graph~~)
 next page.

1/6.2

$$z' = 5 - z, z(0) = 0$$

$$x_0 = 0, z_0 = 0, f(x, z) = 5 - z$$

k	x_k	z_k	S_1	S_2	h	$\frac{S_1 + S_2}{2} h$
0	0.0	0.0000	5.0000	4.5000	0.1	0.4750
1	0.1	0.4750	4.5250	4.0725	0.1	0.4299
2	0.2	0.9049	4.0951	3.6856	0.1	0.3890
3	0.3	1.2939	3.7061	3.3355	0.1	0.3521
4	0.4	1.6460	3.3540	3.0186	0.1	0.3186
5	0.5	1.9646	3.0354	2.7318	0.1	0.2884

1/6.2

$$z' + z = \cos x, z(0) = 1$$

(ii) Solve the equation as a linear one to get

$$z(x) = \frac{1}{2} (\cos x + \sin x + e^{-x})$$

(i), (iii) See the attached graph (next page).