

ECE485 - A1 - Q1

```
1  u = 5;
2  o = 10;
3  a = -5;
4  k = 1/10;
5  step = 0.0001;
6  %x values used for graphing
7  x = -50:step:50;
8  % x values used to calculate D_KL
9  %x = -50:step:500;
10 len = length(x);
11
12 p1= (1/((sqrt(2*pi))*o))*exp(-((x-u).^2)/((2*o^2)));
13
14 p2 = zeros(size(x));
15 for i = 1 : len
16     if x(i) >= a
17         p2(i)= k*exp(-k*(x(i)-a));
18     end
19 end
20
21 % 1a
22 close all;
23 figure();
24 plot(x,p1, '--', 'LineWidth', 2);
25 hold on;
26 plot(x, p2, '-', 'LineWidth', 2);
27 legend('Pw1(x)', 'Pw2(x)')
28 title('1a')
29
30 %1b
31 bi = 0;
32 min_diff_bi = 1000;
33
34 bii = 0;
35 min_diff_bii = 1000;
36
37 biii = 0;
38 min_diff_biii = 1000;
39
40 for i = 1 : len
41     if x(i)>-5 && x(i)< 25
42         if abs(p1(i) - p2(i))< min_diff_bi
43             min_diff_bi = abs(p1(i) - p2(i));
44             bi = x(i);
45         end
46         if abs(p1(i) - 3*p2(i)) < min_diff_bii
47             min_diff_bii = abs(p1(i) - 3*p2(i));
48             bii = x(i);
49         end
50         if abs(3*p1(i) - p2(i)) < min_diff_biii
51             min_diff_biii = abs(3*p1(i) - p2(i));
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```
52         biii =x(i);
53     end
54 end
55
56 end
57
58 figure();
59 plot(x,p1, '--','LineWidth', 2);
60 hold on;
61 plot(x, p2, '--','LineWidth', 2);
62 plot([bi bi], [0 0.1], '-.','LineWidth', 2);
63 %plot([bii bii], [0 0.1], '-.','LineWidth', 2);
64 plot([biii biii], [0 0.1], '-.','LineWidth', 2);
65 legend('Pw1(x)', 'Pw2(x)', '1bi Class Boundary', '1biii Class Boundary')
66 title('1b')
67
68 % 1c
69 D_p1p2 = zeros(size(x));
70 D_p2p1 = zeros(size(x));
71
72
73 for i = 1 : length(x)
74     if p1(i) == 0 || p2(i) ==0
75         D_p1p2(i) = 0;
76         D_p2p1(i) = 0;
77     else
78         D_p1p2(i) = p2(i)*log((p2(i))/(p1(i)));
79         D_p2p1(i) = p1(i)*log((p1(i))/(p2(i)));
80     end
81 end
82
83 DKL_p1p2 = sum(D_p1p2)*step
84 DKL_p2p1 = sum(D_p2p1)*step
```