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(* doing some practical calculations with the lethargy concept *)
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Clear["Global`*"];
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source[x_] := (1 / (d * Sqrt[π])) * Exp[-(x - 20)^2 / d^2];
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d = 0.3;
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a = 10;
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alp = (a - 1)^2 / (a + 1)^2;
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e0 = 20;
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(* delay differential equation *)
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eqn = D[Integrate[F[x] / ((1 - N[alp]) * x), {x, e, e / N[alp]}] - F[e], e] == 0
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$$-\frac{3.025 F[e]}{e} + \frac{3.025 F[1.49383 e]}{e} - F'[e] == 0$$

```
(* [alp*e0,e0] *)
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```

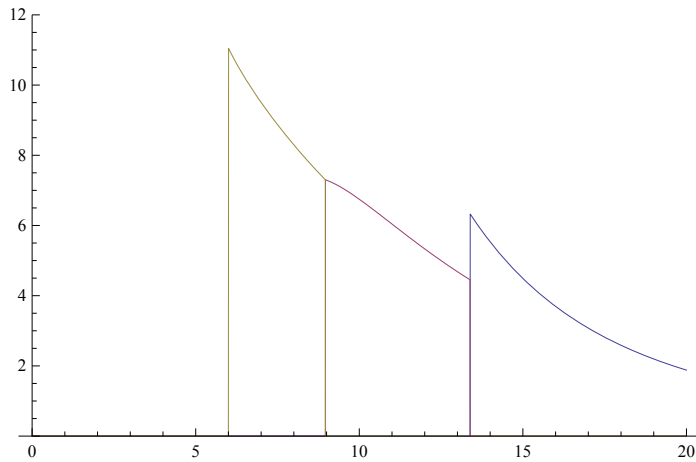
eqn1 = D[Integrate[F1[x] / ((1 - N[alp]) * x), {x, e, e0}] - F1[e], e] == 0;
sol1 = NDSolve[{eqn1, F1[20] == source[20]}, F1, {e, N[alp] * e0, e0}];
g1[e_] := If[(N[alp] * e0) ≤ e ≤ e0, F1[e] /. sol1[[1]][[1]], 0.0001];

(* [alp^2*e0, alp*e0] *)
eqn2 = D[Integrate[F2[x] / ((1 - N[alp]) * x), {x, e, N[alp] * e0}] +
  Integrate[g1[x] / ((1 - N[alp]) * x), {x, N[alp] * e0, e / N[alp]}] - F2[e], e] == 0;
sol2 = NDSolve[{eqn2, F2[N[alp] * e0] == Integrate[g1[x] / ((1 - N[alp]) * x),
  {x, N[alp] * e0, e0}]}, F2, {e, N[alp]^2 * e0, N[alp] * e0}];
g2[e_] := If[N[alp]^2 * e0 ≤ e ≤ N[alp] * e0, F2[e] /. sol2[[1]][[1]], 0.0001];

(* [alp^3*e0, alp^2*e0] *)
eqn3 = D[Integrate[F3[x] / ((1 - N[alp]) * x), {x, e, N[alp]^2 * e0}] + Integrate[
  g2[x] / ((1 - N[alp]) * x), {x, N[alp]^2 * e0, e / N[alp]}] - F3[e], e] == 0;
sol3 = NDSolve[{eqn3, F3[N[alp]^2 * e0] == Integrate[g2[x] / ((1 - N[alp]) * x),
  {x, N[alp]^2 * e0, N[alp]^1 * e0}]}, F3, {e, N[alp]^3 * e0, N[alp]^2 * e0}];
g3[e_] := If[N[alp]^3 * e0 ≤ e ≤ N[alp]^2 * e0, F3[e] /. sol3[[1]][[1]], 0.0001];

Plot[{g1[e], g2[e], g3[e]}, {e, 0.001, 20}, PlotRange → {0, 12}]

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Plot[{g1[e] * e, g2[e] * e, g3[e] * e}, {e, 0.001, 20}, PlotRange → {{0, 20}, {30, 100}}]

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