In[1]:= **d = x (1 - x) k^2 + m^2**

Out[1]= $m^2 + k^2 (1 - x) x$

In[2]:= **d0 = m^2 (1 - x (1 - x))**

Out[2]= $m^2 (1 - (1 - x) x)$

In[3]:= **Integrate[d Log[d / d0], {x, 0, 1}]**

Out[3]= $\text{ConditionalExpression}\Big[\frac{1}{6 k}\Big(4 k^3 + 4 k m^2 - \sqrt{3} k^3 \pi - 2 \sqrt{3} k m^2 \pi + 2 k^2 \sqrt{-k^2 - 4 m^2} \text{ ArcTan}\Big[\frac{k}{\sqrt{-k^2 - 4 m^2}}\Big] + 8 m^2 \sqrt{-k^2 - 4 m^2} \text{ ArcTan}\Big[\frac{k}{\sqrt{-k^2 - 4 m^2}}\Big]\Big),$
$\Big(\text{Im}[m] \Big(\text{Im}[m] + \frac{\text{Re}[k] \text{Re}[m]}{\text{Im}[k]}\Big) \le \text{Re}[m] \Big(\frac{\text{Im}[k] \text{Im}[m]}{\text{Re}[k]} + \text{Re}[m]\Big) \,||\, \Big(\sqrt{1 + \frac{4 \text{Im}[m] \text{Re}[m]}{\text{Im}[k] \text{Re}[k]}} \ge 1 \,\&\&\, \Big(\frac{\sqrt{\text{Im}[k] \text{Re}[k] + 4 \text{Im}[m] \text{Re}[m]}}{\sqrt{\text{Im}[k]} \sqrt{\text{Re}[k]}} \ge 1 \,||\, \frac{\sqrt{\text{Im}[k] \text{Re}[k] + 4 \text{Im}[m] \text{Re}[m]}}{\sqrt{\text{Im}[k]} \sqrt{\text{Re}[k]}} \le -1\Big)\Big)\Big) \,\&\&$
$\Big(\frac{\sqrt{k^4 + 4 k^2 m^2}}{k^2} \notin \text{Reals} \,||\, \text{Re}\Big[\frac{\sqrt{k^4 + 4 k^2 m^2}}{k^2}\Big] \ge 1 \,||\, \text{Re}\Big[\frac{\sqrt{k^4 + 4 k^2 m^2}}{k^2}\Big] \le -1\Big)\Big]$

In[4]:= **Solve[d == 0, x]**

Out[4]= $\Big\{\Big\{x \to -\frac{-k^2 + \sqrt{k^4 + 4 k^2 m^2}}{2 k^2}\Big\}, \Big\{x \to \frac{k^2 + \sqrt{k^4 + 4 k^2 m^2}}{2 k^2}\Big\}\Big\}$

In[5]:= **Integrate[x Log[x - a], {a, 0, 1}]**

Out[5]= $\text{ConditionalExpression}[x (-1 - x \text{ Log}[1 - x] + \text{Log}[-1 + x] + x \text{ Log}[-x]), \text{Re}[x] \ge 1 \,||\, \text{Re}[x] \le 0 \,||\, x \notin \text{Reals}]$

In[6]:= **Integrate[(1 - x) x Log[x - a], {x, 0, 1}]**

Out[6]= $\frac{1}{36} \left(-5 - 12 a + 12 a^2 + 6 (-1 + a)^2 (1 + 2 a) \text{ Log}[1 - a] - 6 a^2 (-3 + 2 a) \text{ Log}[-a]\right)$