

## W10 - P1

$$\text{In[1]:= Integrate}\left[\frac{1}{\sqrt{x^2 + a^2}}, x\right] + C$$

$$\text{Out[1]= } C + \text{Log}\left[x + \sqrt{a^2 + x^2}\right]$$

## W10 - P2

$$\text{In[2]:= } \$\text{Assumptions} = k > 0 \&\& T > 0 \&\& m > 0;$$

$$p[v\_]:= 4 \pi \left(\frac{m}{2 \pi k T}\right)^{3/2} v^2 \text{Exp}\left[-\frac{m v^2}{2 k T}\right];$$

$$\text{Integrate}[v p[v], \{v, 0, \infty\}]$$

$$\text{Out[4]= } 2 \sqrt{\frac{2}{\pi}} \sqrt{\frac{k T}{m}}$$

## W10 - P3

$$\text{In[5]:= } \$\text{Assumptions} = a > 0 \&\& n \in \text{Integers} \&\& n > 0;$$

$$\text{Integrate}[x^{2 n} \text{Exp}[-a x^2], \{x, 0, \infty\}] - \frac{\prod_{k=1}^n (2 k - 1)}{2^{n+1} a^n} \sqrt{\frac{\pi}{a}} // \text{Simplify}$$

$$\text{Out[6]= } 0$$

## W10 - P4

$$\text{In[7]:= Integrate}\left[\frac{1}{\text{Cos}[\theta]}, \theta\right] + C$$

$$\text{Out[7]= } C - \text{Log}\left[\text{Cos}\left[\frac{\theta}{2}\right] - \text{Sin}\left[\frac{\theta}{2}\right]\right] + \text{Log}\left[\text{Cos}\left[\frac{\theta}{2}\right] + \text{Sin}\left[\frac{\theta}{2}\right]\right]$$

$$\text{In[8]:= Integrate}\left[\frac{1}{5 - 3 \text{Cos}[\theta]}, \theta\right] + C$$

$$\text{Out[8]= } C + \frac{1}{2} \text{ArcTan}\left[2 \text{Tan}\left[\frac{\theta}{2}\right]\right]$$

$$\text{In[9]:= Integrate}\left[\frac{1}{1 + \text{Sin}[\theta] + \text{Cos}[\theta]}, \theta\right] + C$$

$$\text{Out[9]= } C - \text{Log}\left[\text{Cos}\left[\frac{\theta}{2}\right]\right] + \text{Log}\left[\text{Cos}\left[\frac{\theta}{2}\right] + \text{Sin}\left[\frac{\theta}{2}\right]\right]$$

## W10 - P5

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In[10]:= A = Series[f[x + h], {h, 0, 2}]
         B = Series[f[x - h], {h, 0, 2}]
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Out[10]= f[x] + f'[x] h +  $\frac{1}{2}$  f''[x] h2 + O[h]3
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Out[11]= f[x] - f'[x] h +  $\frac{1}{2}$  f''[x] h2 + O[h]3
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In[12]:=  $\frac{A - 2 f[x] + B}{h^2}$ 
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Out[12]= f''[x] + O[h]1
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## W10 - P6

X is princess, Y is prince; 1 refers to past, 2 to present, and 3 to future age

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In[13]:= Eliminate[
  {X2 == Y3, X3 == 2 Y1, X1 ==  $\frac{X2 + Y2}{2}$ , X1 - Y1 == X2 - Y2, X1 - Y1 == X3 - Y3}, {X1, Y1, X3, Y3}]
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Out[13]= 4 Y2 == 3 X2
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