In[∘]:=

$$y = \frac{1}{3\,(1+x)} - \frac{-1+2\,x}{6\,(1-x+x^2)} + \frac{2}{3\left(1+\frac{1}{3}\,(-1+2\,x)^2\right)};$$

In[∘]:= `Simplify[%]`

Out[∘]= $\frac{1}{1+x^3}$

In[∘]:= $\text{Simplify}\left[\frac{x^3-1}{x-1}\right]$

Out[∘]= $1+x+x^2$

In[∘]:= $\text{Simplify}\left[\frac{x^5-1}{x-1}\right]$

Out[∘]= $1+x+x^2+x^3+x^4$

In[∘]:= $\text{Factor}\left[x^5+1\right]$

Out[∘]= $(1+x)\,(1-x+x^2-x^3+x^4)$

In[∘]:= `Factor[x^5 - 1]`

Out[∘]= $(-1+x)\,(1+x+x^2+x^3+x^4)$

In[∘]:= $\text{Factor}\left[\frac{x^5-1}{x-1}\right]$

Out[∘]= $1+x+x^2+x^3+x^4$

In[∘]:= $\text{Factor}\left[\frac{x^6-1}{x-1}\right]$

Out[∘]= $(1+x)\,(1-x+x^2)\,(1+x+x^2)$

In[∘]:= `Expand[(1 + x)^5]`

Out[∘]= $1+5\,x+10\,x^2+10\,x^3+5\,x^4+x^5$

In[∘]:= `Coefficient[(x + 1)^5, x, 0]`

Out[∘]= 1

In[∘]:= `Expand[ (a - b)^6]`

Out[∘]= $a^6-6\,a^5\,b+15\,a^4\,b^2-20\,a^3\,b^3+15\,a^2\,b^4-6\,a\,b^5+b^6$

In[∘]:= `Coefficient[(a - b + 3 c)^6, a, 3]`

Out[∘]= $-20\,b^3+180\,b^2\,c-540\,b\,c^2+540\,c^3$

In[∘]:= $\text{Factor}\left[a^6-6\,a^5\,b+15\,a^4\,b^2-20\,a^3\,b^3+15\,a^2\,b^4-6\,a\,b^5+b^6\right]$

Out[∘]= $(a-b)^6$

In[•]:= **Expand[(2 + 3 a)^8 + (1 - 5 a)^4]**

Out[•]= $257 + 3052\,a + 16\,278\,a^2 + 47\,884\,a^3 + 91\,345\,a^4 + 108\,864\,a^5 + 81\,648\,a^6 + 34\,992\,a^7 + 6561\,a^8$

In[•]:= **Series[e^x, {x, 1, 7}]**

Out[•]= $$e + e\,(x-1) + \frac{1}{2}\,e\,(x-1)^2 + \frac{1}{6}\,e\,(x-1)^3 + \frac{1}{24}\,e\,(x-1)^4 + \frac{1}{120}\,e\,(x-1)^5 + \frac{1}{720}\,e\,(x-1)^6 + \frac{e\,(x-1)^7}{5040} + O[x-1]^8$$

In[•]:= **N[Series[Sin[x], {x, 2, 10}]]**

Out[•]= $$0.909297 - 0.416147\,(x-2.) - 0.454649\,(x-2.)^2 + 0.0693578\,(x-2.)^3 + 0.0378874\,(x-2.)^4 - 0.00346789\,(x-2.)^5 - 0.00126291\,(x-2.)^6 + 0.0000825688\,(x-2.)^7 + 0.000022552\,(x-2.)^8 - 1.14679\times10^{-6}\,(x-2.)^9 - 2.50578\times10^{-7}\,(x-2.)^{10} + O[x-2.]^{11}$$

In[•]:= **Normal[%]**

Out[•]= $$0.909297 - 0.416147\,(-2.+x) - 0.454649\,(-2.+x)^2 + 0.0693578\,(-2.+x)^3 + 0.0378874\,(-2.+x)^4 - 0.00346789\,(-2.+x)^5 - 0.00126291\,(-2.+x)^6 + 0.0000825688\,(-2.+x)^7 + 0.000022552\,(-2.+x)^8 - 1.14679\times10^{-6}\,(-2.+x)^9 - 2.50578\times10^{-7}\,(-2.+x)^{10}$$

In[•]:= **Coefficient[(x + 1)^3, x, 5]**

Out[•]= 0

In[•]:= **Coefficient[(x + y)^4, x y^3]**

Out[•]= 0

In[•]:= **Series[g[k], {k, 0, 5}]**

Out[•]= $$g[0] + g'[0]\,k + \frac{1}{2}\,g''[0]\,k^2 + \frac{1}{6}\,g^{(3)}[0]\,k^3 + \frac{1}{24}\,g^{(4)}[0]\,k^4 + \frac{1}{120}\,g^{(5)}[0]\,k^5 + O[k]^6$$

Series[f[x], {x, 0, 5}]

$$f[0] + f'[0]\,x + \frac{1}{2}\,f''[0]\,x^2 + \frac{1}{6}\,f^{(3)}[0]\,x^3 + \frac{1}{24}\,f^{(4)}[0]\,x^4 + \frac{1}{120}\,f^{(5)}[0]\,x^5 + O[x]^6$$

In[•]:= **Series[Tan[x], {x, 0, 5}]**

Out[•]= $$x + \frac{x^3}{3} + \frac{2\,x^5}{15} + O[x]^6$$

In[•]:= **Series[Sinh[x], {x, 1, 5}]**

Out[•]= $$\mathrm{Sinh}[1] + \mathrm{Cosh}[1]\,(x-1) + \frac{1}{2}\,\mathrm{Sinh}[1]\,(x-1)^2 + \frac{1}{6}\,\mathrm{Cosh}[1]\,(x-1)^3 + \frac{1}{24}\,\mathrm{Sinh}[1]\,(x-1)^4 + \frac{1}{120}\,\mathrm{Cosh}[1]\,(x-1)^5 + O[x-1]^6$$

In[∘]:= `N[%]`

Out[∘]= $1.1752+1.54308\,(x-1.)+0.587601\,(x-1.)^2+0.25718\,(x-1.)^3+0.0489667\,(x-1.)^4+0.012859\,(x-1.)^5+O[x-1.]^6$

In[∘]:= `Series[Sqrt[x], {x, 2, 7}]`

Out[∘]= $$\sqrt{2}+\frac{x-2}{2\sqrt{2}}-\frac{(x-2)^2}{16\sqrt{2}}+\frac{(x-2)^3}{64\sqrt{2}}-\frac{5\,(x-2)^4}{1024\sqrt{2}}+\frac{7\,(x-2)^5}{4096\sqrt{2}}-\frac{21\,(x-2)^6}{32\,768\sqrt{2}}+\frac{33\,(x-2)^7}{131\,072\sqrt{2}}+O[x-2]^8$$

In[∘]:= `N[%]`

Out[∘]= $1.41421+0.353553\,(x-2.)-0.0441942\,(x-2.)^2+0.0110485\,(x-2.)^3-0.00345267\,(x-2.)^4+0.00120843\,(x-2.)^5-0.000453163\,(x-2.)^6+0.000178028\,(x-2.)^7+O[x-2.]^8$