

# What's in the help pdf?

- ✓ detailed background on concepts

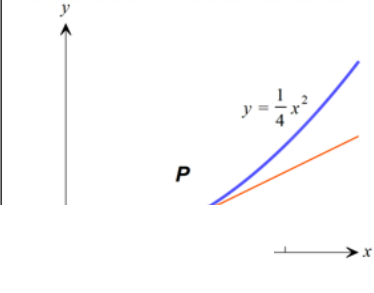
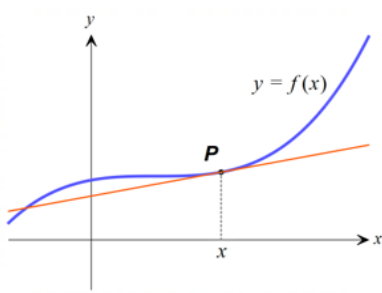
- ✓ 'think' bubbles for each worked example

- ✓ references to other concepts/rules

- ✓ screenshots of Python CAS files

- ✓ required material from Year 10 & Year 11

**what is this formula about?**  $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$  'long answer':

consider:	a particular function $y = \frac{1}{4}x^2$	any function $y = f(x)$
say we need gradient of curve at P at:	$x = 1$	any point $x$
draw tangent to curve at P		

• we need to find the derivative at a point, so use ① → ③ from **dc5**  
 ① 'look' is a quotient **d4**  
 use **d7** for numerator & **d7/d8** for denominator  
 ② substitute  $x = -1$  into rule for  $f'(x)$   
 ③ evaluate, write values of  $a$  &  $b$   
**or**  
 ① use **e5** p. 113 to change 'look' to  $k[g(x)]^n$  **d5** with  $k = 7$ ,  $n = -1$ , simplify by using **e5**  
 ② & ③ as above

$f(x) = \frac{7}{4-x}$   
 $f'(x) = \frac{(4-x) \cdot 0 - 7(-1)}{(4-x)^2} = \frac{7}{(4-x)^2}$   
 $f'(-1) = \frac{7}{(4-(-1))^2} = \frac{7}{5^2} \therefore a=7, b=5$

**or**  $f(x) = \frac{7}{4-x}$   
 $f'(x) = (-1) \cdot 7(4-x)^{-2} \cdot (-1) = \frac{7}{(4-x)^2}$   
 $f'(-1) = \frac{7}{(4-(-1))^2} = \frac{7}{5^2} \therefore a=7, b=5$

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1.1 1.2 approxderiv RAD 1/29
approxderiv3.py
...
def deriv(x):
    return 7/(4-x)**2
...
x=-1
h=0.5
i=1
...
while diff1(x,h)>0.00001 and diff2(x,h)>0.00001
    print('iteration',i,':')
    print('h=',round(h,4),',f(x)=',round(f(x,h),3),
    h=h/2
    i=i+1
    
```

```

1.1 1.2 approxderiv RAD 1/16
Python Shell
>>>#Running approxderiv3.py
>>>from approxderiv3 import *
g'(-1) = 0.28

when x = -1 :
iteration 1 :
h= 0.5 ,f(x)= 0.311 ,b(x)= 0.255 ,c(x)= 0.283
iteration 2 :
h= 0.25 ,f(x)= 0.295 ,b(x)= 0.267 ,c(x)= 0.281
iteration 3 :
h= 0.125 ,f(x)= 0.287 ,b(x)= 0.273 ,c(x)= 0.28
    
```