

1. If you invest \$2000 compounded continuously at 3% per annum, how much will this investment be worth in 4 years? [3A 2C]

2. Explain why the derivative of the exponential function $y = e^x$ is so special compare to all the other functions we've done so far. [2C]

3. Find the derivative of the following functions using the $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ Show all your steps. [3A 2C each]

a. $f(x) = x^2 + 5^x$

b. $f(x) = \frac{1}{2^x}$

4. A radioactive isotope has a half life of 30 years. If we started off with 10 mg of this isotope 12 years ago:

a. Find an expression for the amount of the isotope that is still active using time t measured in years. [2A 1C]

b. How much of the isotope do we have at the present time? [1A]

c. What is the present instantaneous rate of decay? Show a solution using the $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$. [3A]

d. Attach a graph of the quantity of isotope over 100 years. [2A 1C]

5. On attached pages, Using Desmos or other graphing software

a. Attach a graph of $y = \cos(4x)$. [2A 2C]

b. Complete a $x - f'(x)$ table similar to the following [2A]

x	$f'(x)$
0	
$\pi/16$	
$\pi/8$	
...	
π	

c. Plot the points and find a function that will join the points to form a continuous curve. [3A 2C]

d. What is the equation for the derivative of $f(x) = \cos(4x)$? [1A]

e. Complete a similar process for the equation $y = (0.75)^x$. (Note: The equation of the derivative will be of the form $y = k(0.75)^x$.) [8A 4C]