(a) When a loan of $€ P$ is repaid in equal repayments of amount $€ A$, at the end of each of $t$ equal periods of time, where $i$ is the periodic compound interest rate (expressed as a decimal), the formula below can be used to find the amount of each repayment.

$$
A=P \frac{i(1+i)^{t}}{\left((1+i)^{t}-1\right)}
$$

Show how this formula is derived. You may use the formula for the sum of a finite geometric series.
$\qquad$

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(b) Alex has a credit card debt of $€ 5000$. One method of clearing this debt is to make a fixed repayment at the end of each month. The amount of this repayment is $2 \cdot 5 \%$ of the original debt.
(i) What is the fixed monthly repayment, € $A$, required to pay the debt of $€ 5000$ ?

(ii) The annual percentage rate (APR) charged on debt by the credit card company is $21.75 \%$, fixed for the term of the debt. Find as a percentage, correct to 3 significant figures, the monthly interest rate that is equivalent to an APR of $21.75 \%$.

(iii) Assume Alex pays the fixed monthly repayment, € $A$, each month and does not have any further transactions on that card. Complete the table below to show how the balance of the debt of $€ 5000$ is reducing each month for the first three months, assuming an APR of $21.75 \%$, charged and compounded monthly.

| Payment <br> number | Fixed monthly <br> payment, <br> $€ A$ | $€ A$ |  | New balance of <br> debt ( $€$ ) |
| :---: | :---: | :---: | :---: | :---: |
|  |  | Interest | Previous balance <br> reduced by ( $€$ ) |  |
| 1 |  |  |  | $42 \cdot 50$ |

(iv) Using the formula you derived on the previous page, or otherwise, find how long it would take to pay off a credit card debt of $€ 5000$, using the repayment method outlined at the beginning of part (b) above.
Give your answer in months, correct to the nearest month.


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(v) Alex decides to borrow $€ 5000$ from the local Credit Union to pay off this credit card debt of $€ 5000$. The APR charge for the Credit Union loan is $8.5 \%$ fixed for the term of the loan. The loan is to be repaid in equal weekly repayments, at the end of each week, for 156 weeks. Find the amount of each weekly repayment.

(vi) How much will Alex save by paying off the credit card debt using the loan from the Credit Union instead of paying the fixed repayment from part (b)(i) each month to the credit card company?

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