Name: **HW 1.1 Key**

1. Rick invests 200 into a fund that earns interest according to the accumulation function $a(t) = 1 + 0.05t^2$. How much interest did Rick earn during year 5?

   A) 90.0   B) 74.9   C) 79.9   D) 85.0   E) 95.0

   $A(4) = 200(1 + 0.05(16)) = 360$

   $A(5) = 200(1 + 0.05(25)) = 450$

   $I_5 = 450 - 360 = \boxed{90}$

2. Brendan, Melissa, and Jason each invest 320 into separate funds. Brendan's fund earns simple interest at an annual rate of i. Melissa's account earns compound interest at an annual effective rate of j. Jason's account earns simple interest at an annual effective rate of j. It is known that $j < 0.10$.

   The amount of interest earned by Brendan's fund in year 5 is 1.65 times the amount of interest earned by Jason's fund in year 5. At the end of two years, accumulated value of Brendan's fund is 33.05 more than the accumulated value of Melissa's fund.

   Find the accumulated value of Jason's fund after five years.

   A) 456.0   B) 430.5   C) 481.5   D) 507.1   E) 532.6

   B: SI - i
   M: CI - j $j < 0.10$
   J: SI - j

   $320 i = 1.65(320 j) \rightarrow i = 1.65$

   $320(1 + 2i) = 320(1 + j)^2 + 33.05$

   $\cancel{X} + 2i = (\cancel{X} + 2j + j^2) + 0.10328$

   $3.3j = 2j + j^2 + 0.10328$

   $j^2 - 1.3j + 0.10328 = 0$

   $j = 0.085$

   $320(1 + 0.085(5)) = \boxed{456}$

3. Lester deposits 800 into each of three accounts: Account A, Account B, and Account C.

   Account A earns compound interest at an annual effective rate of i. Account B earns compound interest at an annual effective rate of j. Account C earns compound interest at an annual effective rate of j for the first 7 years, and earns an effective annual rate of i for each year thereafter.

   At the end of year 6, the accumulated value of Account A is 1.4187 times the accumulated value of Account B. The accumulated value of Account C at the end of 19 years is 2984.

   Find j.

   A) 3.3%   B) 3.0%   C) 3.1%   D) 3.5%   E) 3.6%

   $t = 6$: $\cancel{800}(1 + i)^6 = 1.4187 \cdot \cancel{800}(1 + j)^6$

   $(1 + i)^6 = 1.4187(1 + j)^6$

   $t = 19$: $800(1 + j)^7 (1 + i)^{12} = 2984$

   $(1 + j)^7 [(1 + i)^6]^2 = 3.73$

 $(1 + j)^7 [1.4187^2 (1 + j)^{12}] = 3.73$

   $(1 + j)^{19} = 1.85322 \rightarrow \boxed{j = 3.3\%}$

4. Money accumulates in a fund at an effective annual interest rate of i during the first 6 years, and at an effective annual interest rate of $2i$ thereafter.

A deposit of 1 is made into the fund at time 0. It accumulates to 15.23 at the end of 16 years and to 182.63 at the end of 28 years.

What is the value of the deposit at the end of 10 years? [1.a.(i-v) #02]

A) 4.4   B) 3.96   C) 4.18   D) 4.62   E) 4.84
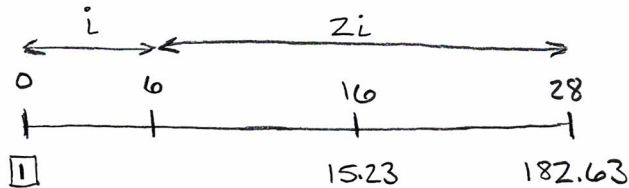
$$15.23(1+2i)^{12} = 182.63 \longrightarrow i = 0.115$$
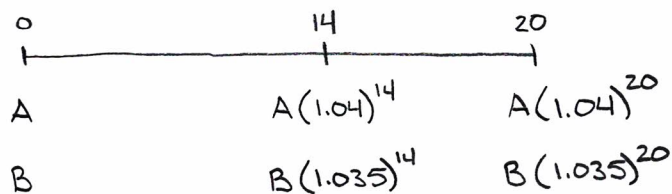
$$(1.115)^6(1.23)^4 = \boxed{4.398}$$

5. Fund A is invested at an effective annual interest rate of 4%.

Fund B is invested at an effective annual interest rate of 3.5%.

At the end of 14 years, the total in the two funds is 14,000. At the end of 20 years, the amount in Fund A is twice the amount in Fund B.

Calculate the total in the two funds at the end of 5 years. [1.a(i-v) #11]

A) 9,984   B) 9,485   C) 10,484   D) 10,983   E) 11,482

$$A(1.04)^{14} + B(1.035)^{14} = 14,000$$
$$A(1.04)^{20} = 2B(1.035)^{20}$$

$$1.73168A + 1.61869B = 14,000$$
$$A = 1.81623 B$$

$$3.14512 B + 1.61869 B = 14,000 \longrightarrow B = 2938.82$$
$$A = 5337.58$$

$$A(1.04)^5 + B(1.035)^5 = \boxed{9984.38}$$