Alignment

1. Let \( s = AACGAT \) and \( t = ACTCT \). Let scores be 2 for match an -2 for mismatch and use the linear gap penalty with \( d = 3 \). Find an optimal global alignment of \( s \) with \( t \).

2. Let \( s = AACAGTATCGCT \) and \( t = CAGGTAT \). Let scores be 2 for match an -2 for mismatch and use the linear gap penalty with \( d = 3 \). Find an optimal local alignment of \( s \) with \( t \).

3. Let \( s = ACAGT \) and \( t = AAACAGGTATATGTCACT \) with scores 2 for match an -2 for mismatch and use the linear gap penalty with \( d = 3 \). Find an optimal semi-global alignment of \( s \) with \( t \).

4. Let \( s = AAT \) and \( t = AACGT \) with scores 3 for match, -2 for mismatch and the affine gap penalty with \( d = 3 \) and \( e = 1 \). Find an optimal global alignment of \( s \) with \( t \).

5. Let \( s = AAT \) and \( t = AACGT \) with scores 3 for match, -2 for mismatch and the the following gap penalty function \( \gamma(1) = -1.5, \gamma(2) = -3, \) and \( \gamma(k) = -5 \) for \( k \geq 3 \). Find an optimal global alignment of \( s \) with \( t \).

6. Estimate the running time ("big Oh" estimate) of the dynamic programming algorithm for the following problems:

   (a) Global alignment problem with gap penalty function \( \gamma(g) = -2g^2 \).
   (b) Global alignment problem with gap penalty function \( \gamma(g) = -5 - 2g \).
   (c) Global alignment algorithm with gap penalty function \( \gamma(g) = -2 \).
   (d) Global alignment algorithm with gap penalty function \( \gamma(g) = -3g \).