MATH 121 EXAM 3

There will be **50** minutes for you to finish the exam, if you ever get stuck, move on and circle back to it. **No calculators**, one problem per sheet, 100 points in total

1. Determine if the following series or improper integrals are convergent
   (a) (20 points) $\sum_{k=0}^{\infty} \frac{k+2}{k^2+2k+1}$
   (b) (10 points) $\int_1^{\infty} \frac{5^x}{7^x} dx$

2. (a) (10 points) Evaluate $\sum_{k=0}^{\infty} \frac{1}{2^{3k}}$
   (b) (10 points) Determine which rational number has decimal expansion $9.\overline{99}$
   (c) (10 points) Suppose $f(x) = 5(x-1)^3 - 17(x-1)^{11}$, compute $f^{(11)}(1)$

3. (a) (20 points) Evaluate $1 + \frac{2}{2} + \frac{3}{4} + \frac{4}{8} + \frac{5}{16} + \frac{6}{32} + \frac{7}{64} + \cdots$

   Hint: what is the derivative of $\frac{1}{1-x} = \sum_{k=0}^{\infty} x^k$

4. (a) (20 points) A cement company plans to bid on a contract for constructing the foundations of new homes in a housing development. The company is considering two bids: a high bid that will produce $\$75,000$ profit(if the bid is accepted) and a low bid that will produce $\$40,000$ profit.From past experience, the company estimates that the high bid has a 30% chance of acceptance and the low bid a 50% chance. Which bid should the company make?