Read each problem carefully. Please show all your work for each problem! Use only those methods discussed thus far in class. No calculators!

1. (10 points) Differentiate
   
   (a) \( f(x) = \arcsin(x^2 + 2x + 3) \),  
   (b) \( g(z) = \sin(2z) \sinh(3z) \).

2. (20 points) Integrate
   
   (a) \( \int \tan^2(3x) \, dx \),  
   (b) \( \int \sin^3(x) \cos^2(x) \, dx \).

3. (10 points) Integrate
   \( \int x \arctan x \, dx \).

4. (15 points) Integrate
   \( \int \frac{1}{x(x + 2)^2} \, dx \).

5. (15 points) Integrate
   \( \int \frac{2x^2 + 3x + 4}{x^2 + 16} \, dx \).

6. (15 points) Integrate (Hint: use trigonometric substitution)
   \( \int_0^1 \sqrt{4 - x^2} \, dx \).

7. (15 points) Find the area under the curve
   
   \( y = \frac{1}{x^2 - 6x + 13} \),

   and above the \( x \)-axis, if \( 1 \leq x \leq 3 \).