

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:

$$(a) f(x) = x \arcsin(1 + 2 \sin x), \quad (b) g(x) = x^2 \cosh\left(\frac{1}{x}\right).$$

2. (10 points) Find all the points on the graph of $y = 2 \arctan x$ at which the tangent line has slope 1. Find the equations of those tangent lines. Draw a sketch.

3. (10 points) Integrate:

$$\int t^2 e^{4t} dt.$$

4. (10 points) Integrate:

$$\int \sin^3 x dx$$

5. (12 points) Integrate:

$$\int \frac{1}{\sqrt{x}(x+1)} dx$$

6. (12 points) Integrate:

$$\int \frac{5x-7}{x^2-3x+2} dx.$$

7. (12 points) Integrate:

$$\int \frac{x+1}{x^2+4x+5} dx.$$

8. (12 points) Integrate:

$$\int \frac{x^2}{\sqrt{9-x^2}} dx.$$

9. (12 points) Integrate:

$$\int \frac{1 - \cos 2x}{1 + \cos 2x} dx.$$