1. Find the number $c$ such that the area between the functions $f(x) = x^2$ and $g(x) = c^2 - x^2$ is equal to $c$.

2. Solve the following integrals:
   
   (a) $\int \frac{1}{\sqrt{t}(\sqrt{t} + 4)^3} \, dt$
   
   (b) $\int \frac{2u + 3}{\sqrt{1 - u^2}} \, du$

3. Solve the following definite integral:

   $\int_{-3}^{4} |j + 2| + |j - 2| \, dj$

4. Solve the following definite integral without finding the anti-derivative:

   $\int_{-3}^{3} (3x + 5)\sqrt{9 - x^2} \, dx$

5. Find the area between the curves $f(x) = 4x$ and $g(x) = x^3$.

6. Solve the following integrals:

   (a) $\int (t + 7)^{107}(2t - 5) \, dt$
   
   (b) $\int 3^5(l^3 + 5)^4 \, dl$
   
   (c) $\int e^k \sin(e^k) + e^k \cos(e^k) \, dk$

7. Find the following indefinite integrals:

   (a) $\int \sin(p) \cos^3(p) + 4e^{3p} \, dp$
   
   (b) $\int \frac{6}{s^2 + 2s + 2} \, ds$
   
   (c) $\int \frac{t - 1}{t + 1} \, dt$

8. Find the area between $x^2 + 2$, $12 - 3x$ and the first quadrant ($x \geq 0, y \geq 0$).

9. Let $g(x) = \int_{0}^{\tan(x)} 3e^{t^2} + 5 \, dt$. Find:

   (a) $g'(\frac{\pi}{4})$
   
   (b) $g(2) + g(-2)$