Part 1. NO CALCULATOR

Integrate the following:

1. $\int (3x + 1)^5 dx =$

2. $\int x^3 \cos(x^3) dx =$

3. $\int_0^1 \sqrt{x}(x + 1)dx =$

4. If $\frac{dy}{dx} = \sin x \cos^2 x$ and if $y = 0$ when $x = \frac{\pi}{2}$, what is the value of y when $x = 0$?

5. $\int x^2 \sin x \, dx =$

6. Find the area enclosed by the ellipse with parametric equations $x = 2\cos\theta$ and $y = 3\sin\theta$.

7. $\int_0^\infty e^{-x} dx$

8. The equation of the curve whose slope at point (x, y) is $x^2 - 2$ and which contains the point (1, -3) is:

9. $\int \frac{x^2}{x^2 - 1} dx =$

Part 2. CALCULATOR ALLOWED

10. If f is the antiderivative of $\frac{x^2}{1+x^5}$ such that $f(1) = 0$, then $f(4) =$

11. To three decimal places, $\int_0^1 \frac{dx}{\sqrt{4-x^2}} =$

12. Find the value of x at which the function $y = x^2$ reaches its average value on the interval [0, 10].