

Pre-Entry Test for EMTH118/MATH102

This test is to help you determine if you have the background and skills needed to enrol in EMTH118 or MATH102. Print out the test, and work through the questions. You should do this test with pen and paper only. Do NOT use a calculator or reference books. The test should take **no more than 1** hour. After completing the test, use the solutions file to mark your answers. Each completely correct question is worth one mark, and we would expect students enrolling in EMTH118 or MATH102 to get **at least 75%** or 12/16 correct.

1. If $x^2 + 8x + 5 = (x + a)^2 + b$, find the values of a and b .
2. Solve $\ln(2x + 1) - \ln(x - 1) = 2 \ln 4$.
3. If $f(x) = x^2 + 1$, give the equation of the line that passes through $(1, f(1))$ and $(3, f(3))$.
4. If $f(x) = x^3 - 2x$, find and simplify $f(x - 2)$.
5. Solve $3 - p < p + 4$.
6. Solve the following system of equations.

$$2x + 3y = -1$$

$$3x - 5y = -11$$

7. Find where the line $2x - y = 1$ intersects the circle $x^2 + y^2 = 2$.
8. Sketch the graph of $y = (x - 1)(3 - x)(x + 2)$.
9. Sketch the graph of the trigonometric function $y = \tan \theta$ for $-\pi \leq \theta \leq \pi$.
10. Find the equation of the tangent line to the curve $y = 3x - x^2$ at the point $(4, -4)$.
11. Differentiate the function $y = e^{2x} - \frac{1}{x}$.
12. Find the derivative of the function $f(x) = x^2 \sin x$.
13. Differentiate $f(x) = \sqrt{x^2 - 1}$.
14. Evaluate $\int_0^3 (t^2 + 3t - 6) dt$.
15. Find the integral $\int \frac{2x}{\sqrt{x^2 + 4}} dx$
16. Find the area under the curve $y = \sqrt{x}$ from $x = 1$ to $x = 4$.