

Calculus Problems

If you can do these problems, you know all the calculus you will need for Physics 100. If there are some you cannot solve, bring them to Conference, the Science Center, or office hours, and we will be happy to help you with them.

Differential Calculus

Differentiate the following functions:

$$(1) \quad 4x^3$$

$$(2) \quad x^2 + 3x + 2$$

$$(3) \quad 2(\sin x)(\cos x)$$

$$(4) \quad (\sin x)/x$$

$$(5) \quad 5 \cos(2x)$$

$$(6) \quad 4x \sin(3x^2)$$

$$(7) \quad 2e^{-3x}$$

$$(8) \quad 3e^{-2x^2}$$

Calculate the *second* derivatives of the following functions:

$$(9) \quad 3 \sin(2x)$$

$$(10) \quad x^3 + 2x^2 + 3x + 4$$

(11) Find the slope of the function $y(x) = 2x^3$ at the point $x = 2$.

Integral Calculus

Find the following *indefinite* integrals:

$$(12) \quad \int 4x^3 dx$$

$$(13) \quad \int \cos(2x) dx$$

$$(14) \quad \int (x^2 + 3x + 2) dx$$

$$(15) \quad \int (2/x) dx$$

Evaluate the following *definite* integrals:

$$(16) \quad \int_1^3 (2x + 3) dx$$

$$(17) \quad \int_0^\pi (\sin x) dx$$

(18) Find the area under the graph of $y(x) = 3x^2$, between $x = 2$ and $x = 4$.

Answers: (1) $12x^2$; (2) $2x + 3$; (3) $2(\cos^2 x - \sin^2 x)$; (4) $(x \cos x - \sin x)/x^2$;
(5) $-10 \sin(2x)$; (6) $4 \sin(3x^2) + 24x^2 \cos(3x^2)$; (7) $-6e^{-3x}$; (8) $-12xe^{-2x}$;
(9) $-12 \sin(2x)$; (10) $6x + 4$; (11) 24 ; (12) $x^4 + c$; (13) $(1/2) \sin(2x) + c$;
(14) $(1/3)x^3 + (3/2)x^2 + 2x + c$; (15) $2 \ln x + c$; (16) 14 ; (17) 2 ; (18) 56 .