

Tutorial Exercises — Powers, Exponentials Anti-derivatives, Integrals

MATH 130, Elementary Mathematics, 2nd Semester 2006

Week 8: Thursday, Friday, Monday 5–6 & 9 October

Ex. 1. Find the anti-derivative of each of the following functions:

- (a) $f(x) = 4x^3 + 2x - 5$
 (b) $g(x) = 3x^4 + \frac{3}{x^2} - \frac{2}{x^5}$
 (c) $h(x) = 3 \sin 2x + 4 \cos 4x$
 (d) $\phi(x) = 3e^x + 9 \sec^2 3x - 4 \tan x \cos x$
 (e) $\psi(x) = 3e^{2x} - 3e^{-2x} + 4\sqrt{2x} - 2.$

Ex. 2. Find the anti-derivative of each of the following functions, noting that if $f(x) = F'(x)$ and $f(x) = g(ax + b)$ then $F(x) = \frac{1}{a} G(ax + b)$, where $G'(ax + b) = g(ax + b)$.

- (a) $f(x) = (3x + 2)^5$ (c) $f(x) = \sin(4x - 1)$ (e) $f(x) = 3e^{2x+3}$
 (b) $f(x) = 4\sqrt{2x - 7}$ (d) $f(x) = 6 \sec^2(2 - 3x)$ (f) $f(x) = 2e^{5-2x}.$

Ex. 3. Evaluate the following definite integrals:

- (a) $\int_1^3 (4x - 3)^3 dx$ (b) $\int_{-1}^1 (x^3 + 2x^2 - 3x + 4) dx$ (c) $\int_0^{\frac{1}{3}\pi} \cos x dx.$

Ex. 4. Simplify the following expressions:

- (a) $\frac{4a^2(bc)^{-1}}{(-2)^2 a^3 b^{-2} c},$ (b) $\left[\left(\frac{b^{-3}}{a^2} \right) \left(\frac{a^{-2}}{ab} \right)^{-1} \right]^k,$ (c) $\left(\frac{b^{-3}}{a^2} \right) \left(\frac{a^{-2}}{ab} \right)^{-1},$ (d) $\sqrt[4]{25a^2b^8}.$

Ex. 5. Find the value of the unknown variable in each of these:

- (i) $2^x = \sqrt{128},$ (ii) $3^y = \frac{1}{9},$ (iii) $5^x = 625,$ (iv) $4^s = 16,$ (v) $16^t = 4,$
 (vi) $8^x = \frac{1}{4}.$

Ex. 6. Solve the following equations for all the value(s) of x that make the statement valid.

- (i) $2x - 1 = \sqrt{4x^2 + 9},$ (ii) $x + 4 = \sqrt{x^2 + 4},$ (iii) $9^{4x} = 81 \times 3^{5x}$ (iv) $\frac{4^{3x}}{32} = 8^{5x-2}.$