DAY 39

§3.1 POWERS & POLYNOMIALS

The Power Rule $\longrightarrow$ $\boxed{\begin{array}{l} y = ax^n \\ \frac{dy}{dx} = a \cdot n \cdot x^{n-1} \end{array}}$

pp. 129–130
#3–5, 6–36 (mult of 3) 23, 35

(3) $y = 3^x$ power rule does NOT apply. This is an exponential function.

(4) $y = x^3$ power rule applies $\therefore$ $\frac{dy}{dx} = 3x^2$

(5) $y = x^{\pi}$ power rule applies $\therefore$ $\frac{dy}{dx} = \pi x^{\pi - 1}$

(6) $y = x^{12}$ $\frac{dy}{dx} = 12x^{11}$

(9) $y = x^{-12}$ $\frac{dy}{dx} = -12x^{-13} = \frac{-12}{x^{13}}$ *

(12) $y = x^{4/3}$ $\frac{dy}{dx} = \frac{4}{3}x^{1/3} = \frac{4x^{1/3}}{3} = \frac{4\sqrt[3]{x}}{3}$ *

(15) $f(x) = x^3 - 3x^2 + 8x - 4$
$f'(x) = 3x^2 - 6x + 8$

(18) $f(x) = \frac{-1}{x^{6.1}} = -x^{-6.1}$
$f'(x) = +6.1\,x^{-7.1} = \frac{6.1}{x^{7.1}}$ *

(21) $f(x) = \sqrt[4]{x} = x^{1/4}$
$f'(x) = \frac{1}{4}x^{-3/4} = \frac{1}{4x^{3/4}}$ *

(23) $f(x) = \sqrt{\frac{1}{x^3}} = x^{-\frac{3}{2}}$
$f'(x) = -\frac{3}{2}x^{-5/2} = \frac{-3}{2x^{5/2}}$ *

(24) $h(x) = \ln e^{ax} = ax$
$h'(x) = a$

(27) $y = 17x + 24x^{1/2}$
$\frac{dy}{dx} = 17 + 12x^{-1/2}$
$\frac{dy}{dx} = 17 + \frac{12}{\sqrt{x}} = \frac{17\sqrt{x} + 12}{\sqrt{x}}$ *

(30) $h(x) = -2x^{-3} + 3\sqrt{x}$
$h(x) = -2x^{-3} + 3x^{1/2}$
$h'(x) = +6x^{-4} + \frac{3}{2}x^{-1/2}$
$h'(x) = \frac{6}{x^4} + \frac{3}{2\sqrt{x}}$
$h'(x) = \frac{6 \cdot 2}{x^4 \cdot 2} + \frac{3 \cdot x^{7/2}}{2\sqrt{x} \cdot x^{7/2}}$
* $h'(x) = \frac{12 + 3x^{7/2}}{2x^4}$

(33) $y = 3t^2 + \frac{12}{\sqrt{t}} - \frac{1}{t^2}$
$y = 3t^2 + 12t^{-1/2} - t^{-2}$
$\frac{dy}{dt} = 6t^2 - 6t^{-3/2} + 2t^{-3}$
$\frac{dy}{dt} = 6t^2 - \frac{6}{t^{3/2}} + \frac{2}{t^3}$
* $\frac{dy}{dt} = \frac{6t^5 - 6t^{3/2} + 2}{t^3}$

DAY 39 continued

35) $y = x^{3/2}(2+\sqrt{x})$

$y = 2x^{3/2} + x^2$

$\frac{dy}{dx} = 3x^{1/2} + 2x$

$\frac{dy}{dx} = 3\sqrt{x} + 2x$

36) $h(x) = \frac{3}{x} + \frac{4}{x^2}$

$h(x) = 3x^{-1} + 4x^{-2}$

$h'(x) = -3x^{-2} - 8x^{-3}$

$h'(x) = \frac{-3}{x^2} - \frac{8}{x^3}$

$h'(x) = \frac{-3x-8}{x^3}$ *

* Get in the habit of writing derivative as a single common denominator fraction because it will make our lives easier when we actually need to do some stuff with the derivative like find out where

$f'(x) = 0$ or $f'(x)$ is undefined

b/c

$f'(x) = \frac{\text{numer}}{\text{denom}} = 0$ when $\boxed{\text{numer} = 0}$

and

$f'(x) = \frac{\text{numer}}{\text{denom}}$ is undefined when $\boxed{\text{denom} = 0}$