

KEY

5.5 Bases other than e

<p>Find f' $f(t) = \frac{3^{2t}}{t}$</p> $f'(t) = \frac{3^{2t}(2t \ln 3 - 1)}{t^2}$	<p>Find f' $f(x) = \log_5 \frac{x\sqrt{x-1}}{2}$</p> $f'(x) = \frac{1}{x \ln 5} + \frac{1}{2(x-1) \ln 5}$	<p>Find the equation of the tangent line at $(2, 1)$, $y = 5^{x-2}$</p> $y - 1 = \ln 5(x - 2)$
<p>Use log differentiation to find y'</p> $y = (1+x)^{\frac{1}{x}}$ $y' = \left(\frac{1}{x+x^2} - \frac{\ln(1+x)}{x^2} \right) (1+x)^{1/x}$	<p>Find the equation of the tangent line at $(\pi/2, 1)$, $y = (\sin x)^{2x}$</p> $y = 1$	<p>$\int 5^{-x} dx =$</p> $\frac{-5^{-x}}{\ln 5} + C$
<p>$\int (3-x)7^{(3-x)^2} dx =$</p> $\frac{-7(3-x)^2}{2 \ln 7} + C$	<p>$\int_1^e (6^x - 2^x) dx$</p> $\left(\frac{6^e}{\ln 6} - \frac{2^e}{\ln 2} \right) - \left(\frac{6}{\ln 6} - \frac{2}{\ln 2} \right)$	<p>Find the area of the region $y = 3^{\cos x} \sin x$ bounded by $y=0$, $x=0$, $x=\pi$</p> $\frac{3}{\ln 3} - \frac{1}{3 \ln 3}$

5.5 Bases other than e

* 1) $f(t) = \frac{3^{2t}}{t}$ Quotient

$$f'(t) = \frac{t(\ln 3 \cdot 3^{2t} \cdot 2) - 3^{2t}}{t^2}$$

2) $f(x) = \log_5 \left(\frac{x\sqrt{x-1}}{2} \right)$

$$f(x) = \log_5 x + \frac{1}{2} \log_5 (x-1) - \log_5 2$$

$$f'(x) = \frac{1}{\ln 5 \cdot x} + \frac{1}{2 \ln 5 \cdot (x-1)}$$

$$f'(x) = \frac{1}{x \ln 5} + \frac{1}{2(x-1) \cdot \ln 5}$$

3) $y = 5^{x-2}$ (2, 1)

$$y' = 5^{x-2} \cdot 1 \cdot \ln 5$$

$$y'(2) = 5^0 \cdot 1 \cdot \ln 5$$

$$y'(2) = \ln 5$$

$$y-1 = \ln 5 (x-2)$$

4) $y = (1+x)^{1/x}$

$$\ln y = \frac{1}{x} \ln(1+x)$$

$$\frac{1}{y} \frac{dy}{dx} = \left(\frac{1}{x} \left(\frac{1}{1+x} \right) + \ln(1+x) \left(-\frac{1}{x^2} \right) \right)$$

$$\frac{dy}{dx} = \left(\frac{1}{x+x^2} - \frac{\ln(1+x)}{x^2} \right) (1+x)^{1/x}$$

$$5) y = (\sin x)^{2x} \quad \left(\frac{\pi}{2}, 1\right)$$

$$y' = (\sin x)^{2x} \cdot 2 \cdot \ln(\sin x)$$

$$y'\left(\frac{\pi}{2}\right) = \left(\sin \frac{\pi}{2}\right)^{2\left(\frac{\pi}{2}\right)} \cdot 2 \cdot \ln\left(\sin \frac{\pi}{2}\right)$$

$$y' = (1)^\pi \cdot 2 \cdot \ln 1$$

$$y' = 0 \quad \boxed{y=1}$$

$$* 6) \int 5^{-x} dx = \frac{-1}{\ln 5} \cdot 5^{-x} + C \quad \begin{array}{l} u = -x \\ du = -dx \\ -du = dx \end{array}$$

$$\boxed{-\frac{5^{-x}}{\ln 5} + C}$$

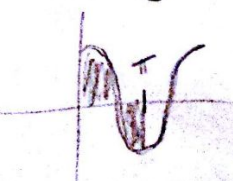
$$* 7) \int (3-x) \cdot 7^{(3-x)^2} dx \quad \begin{array}{l} u = (3-x)^2 \\ du = -2(3-x) dx \\ -\frac{1}{2} du = (3-x) dx \end{array}$$

$$-\frac{1}{2} \int 7^u du$$

$$= -\frac{1}{2} \cdot \frac{1}{\ln 7} \cdot 7^u + C = \boxed{\frac{-7^{(3-x)^2}}{2 \ln 7} + C}$$

$$8) \int_1^e (6^x - 2^x) dx = \frac{1}{\ln 6} \cdot 6^x - \frac{1}{\ln 2} \cdot 2^x \Big|_1^e$$

$$\boxed{\left(\frac{1}{\ln 6} \cdot 6^e - \frac{1}{\ln 2} \cdot 2^e\right) - \left(\frac{1}{\ln 6} \cdot 6 - \frac{1}{\ln 2} \cdot 2\right)}$$

$$9) y = 3^{\cos x} \cdot \sin x \quad \int_0^\pi 3^{\cos x} \cdot \sin x dx$$


$$u = \cos x$$

$$du = -\sin x dx$$

$$u(0) = 1$$

$$u(\pi) = -1$$

$$-\int_1^{-1} 3^u du = \int_{-1}^1 3^u du = \frac{1}{\ln 3} \cdot 3^u \Big|_{-1}^1$$

$$\boxed{\frac{3}{\ln 3} - \frac{1}{3 \ln 3}}$$