C.E.M.TUITION

Name : _____

Review of Rules and Formulae
Derivatives, integrals, volumes, radian measures, logarithms & parabolas

Year 12 - Mathematics

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For corrections refer to pages:

DERIVATIVES :
Formulae and examples :

[1] [a] If $y = x^n$ then $\frac{dy}{dx} =$

[b] If $y = x\sqrt{x}$, find $\frac{dy}{dx}$

[2] [a] If $y = u.v$ then $\frac{dy}{dx} =$

[b] If $y = x^2(1-x)^3$, find $\frac{dy}{dx}$

[3][a] If $y = \frac{u}{v}$ then $\frac{dy}{dx} =$

[b] If $y = \frac{2x-1}{x^2+1}$ find $\frac{dy}{dx}$

[4] [a] If $y = e^x$ then $\frac{dy}{dx} =$

[b] If $y = x.e^x$, find $\frac{dy}{dx}$

[5] [a] If $y = e^u$ then $\frac{dy}{dx} =$

[b] If $y = e^{3x-5}$, find $\frac{dy}{dx}$

[6] [a] If $y = \ln x$ then $\frac{dy}{dx} =$

[b] If $y = \ln \sqrt{x}$ find $\frac{dy}{dx} =$

[7] [a] If $y = \ln u$ then $\frac{dy}{dx} =$

[b] If $y = \ln \sqrt[3]{3x^2 - 7}$, find $\frac{dy}{dx}$

[8] If $y = \sin x$ then $\frac{dy}{dx} =$

[9] [a] If $y = \sin u$ then $\frac{dy}{dx} =$

[b] If $y = \sin(2x + 1)$, find $\frac{dy}{dx} =$

[10] [a] If $y = \cos u$ then $\frac{dy}{dx} =$

[b] If $y = \cos x^2$, find $\frac{dy}{dx}$

[11] [a] If $y = \tan u$ then $\frac{dy}{dx} =$

[b] If $y = \tan(\sin x)$, find $\frac{dy}{dx}$

INTEGRALS :
Formulae and examples :

[1] [a] $\int x^n \, dx =$

[b] $\int x\sqrt{x} \, dx =$

[2] [a] $\int e^{ax} dx =$

[b] $\int e^{\pi x} dx =$

[3] [a] $\int e^{f(x)} f'(x) \, dx =$

[b] Find $\int e^{\cos x} . \sin x \, dx =$

[4] [a] $\int \frac{f'(x)}{f(x)} \, dx =$

[b] $\int \frac{5x}{x^2+1} \, dx =$

[c] $\int \frac{x+2}{x^2+4x-9} \, dx =$

[5] $\int \sin(2x+1)\,dx =$

[6] $\int \cos(\pi x - 4)\,dx =$

[7] $\int \sec^2 6x\,dx =$

AREAS AND VOLUMES :

[1] Volume of solid of revolution about the :

[a] x–axis from $x = a$ to $x = b$ is given by $V =$

[b] y-axis from $y = c$ to $y = d$ is given by $V =$

[2] Find the volume generated by the revolving the function $y = x^3$ from $x = 1$ to $x = 4$

[a] about the x–axis.

[b] about the y–axis

LOGARITHMS :

[1] [a] If $y = a^x$ then $x =$

[b] Find $\log_5 125$

Complete these laws of logarithms :

[2] [a] $\log(mn) =$

[b] Simplify : $\log x + \log 2y$

[3] [a] $\log\left(\frac{m}{n}\right) =$

[b] Simplify : $\log p - \log pq$

[c] Solve for x if $\log 3 = \log x - \log 2$

[4] [a] Simplify : $\log x^n =$

[b] Solve : $2\log 3 = \log(x+1)$

[5] If $\log_a b = \frac{\ln b}{\ln a}$, find $\log_4 7$ to 2 decimal places.

RADIAN MEASURE :

[1] π radians = (in degrees).

[2] [a] Change $\frac{5\pi}{6}$ radians to degrees

[b] Change 330^0 to radians

[3] [a] Complete the formula for : Arc length, $l =$

[b] Find the arc swept by the minute hand, measuring 10 cm, in 16 minutes.

[4] [a] Complete the formula for : Area of sector, $A_{\text{sector}} =$

[b] Find the area of sector swept by the same minute hand in 20 minutes

[5] [a] Complete the formula for : Area of minor segment =

[b] Find the area of the minor segment joined by the tips of the minute hand as it sweeps from 0 to 20 minutes.

THE PARABOLA :

Find the focus, vertex and the equation of the directrix of the parabola :

[1] $x^2 = 25y$

[2] $x^2 + 2x = -8y + 15$

Solutions :

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[1] [a] nx^{n-1} [b] $\frac{3\sqrt{x}}{2}$ [2] [a] $uv'+vu'$ [b] $x(1-x)^2(2-5x)$

[3] [a] $\frac{vu'-uv'}{v^2}$ [b] $\frac{-2(x^2-x-1)}{(x^2+1)^2}$

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[4] [a] e^x [b] $e^x(x+1)$ [5] [a] $e^u.\frac{du}{dx}$ [b] $3e^{3x-5}$

[6] [a] $\frac{1}{x}$ [b] $\frac{1}{2x}$ [7] [a] $\frac{1}{u}\cdot\frac{du}{dx}$ [b] $\frac{2x}{3x^2-7}$

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[8] $\cos x$ [9] [a] $\cos u \times u'$ [b] $2\cos(2x+1)$

[10] [a] $-\sin u \times u'$ [b] $-2x\sin x^2$

[11] [a] $\sec^2 u \times u'$ [b] $\cos x.\sec^2(\sin x)$

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[1] [a] $\frac{x^{n+1}}{n+1}+c$ [b] $\frac{2x^{\frac{5}{2}}}{5}+c$

[2] [a] $\frac{e^{ax}}{a}+c$ [b] $\frac{e^{\pi x}}{\pi}+c$

[3] [a] $e^{f(x)}+c$ [b] $-e^{\cos x}+c$

[4] [a] $\ln f(x)+c$ [b] $\frac{5}{2}\ln(x^2+1)+c$ [c] $\frac{1}{2}\ln(x^2+4x-9)+c$

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[5] $\frac{-\cos(2x+1)}{2}+c$ [6] $\frac{\sin(\pi x-4)}{\pi}+c$ [7] $\frac{\tan 6x}{6}+c$

Areas and volumes

[1] [a] $\pi \int_a^b y^2\,dx$ [b] $\pi \int_c^d x^2\,dy$

[2] [a] $\frac{16383\pi}{7}$

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[b] $\frac{3069\pi}{5}$

Logarithms

[1] [a] $\log_a y$ [b] 3 [2] [a] $\log m + \log n$ [b] $\log 2xy$

[3] [a] $\log m - \log n$ [b] $-\log q$ [c] $x = 6$

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[4] [a] $n \log x$ [b] $x = 8$

[5] 1.40

Radian measure

[1] 180^0 [2] [a] 150^0 [b] $\frac{11\pi}{6}$

[3] [a] $r\theta$ [b] $\frac{16\pi}{3}$

[4] [a] $\frac{1}{2}r^2\theta$ [b] $\frac{100\pi}{3}$

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[5] [a] $\frac{1}{2}\,r^2(\theta - \sin\theta)$ [b] $\frac{25}{3}\,(4\pi - 3\sqrt{3})$

The parabola

[1] Vertex $(0, 0)$ Focus $(0, \frac{25}{4})$ Directrix is $y = -6\frac{1}{4}$

[2] Vertex $(-1, 2)$ Focus $(-1, 0)$ Directrix is $y = 4$