# Calculus Review Worksheet

**(1)** Find $\frac{dy}{dx}$ and simplify please.

**(a)** $y = \sin^{-1}\left(\sqrt{2x - 1}\right)$

**(b)** $y = 3\cos^{-1}\left(x^3\right)$

**(c)** $y = \csc^{-1}\left(e^{3x}\right)$

**(d)** $y^2 = 4x\ln(5x)$

**(e)** $y = x^2\sin^{-1}\left(\sqrt{x}\right)$

**(f)** $y = \sqrt{x} - \tan^{-1}\left(\sqrt{x}\right)$

**(g)** $y = x\ln^2\left(x^2\right)$

**(h)** $y = \ln\left(\frac{2x-1}{3x+5}\right)$

**(i)** $y = x\,e^{\sin(x)}$

**(j)** $y = \sin^{-1}\left(e^{2x}\right)$

**(k)** $y = \tan^{-1}\left(\sqrt{x^2 - 1}\right)$

**(l)** $y = x\sec^{-1}\left(\sqrt{x}\right) - \left(\sqrt{x-1}\right)$

**(m)** $y = x^{\cos(x)}$

**(n)** $y = \ln\left(\sec(x) + \tan(x)\right)$

**(o)** $y = \log_{10}(x)$

**(p)** $\tan(y) = e^x + \ln(x)$

**(2)** Let $f(x) = x^2 + 4x + 3,\ x \geq -2$, and let g be the inverse of f. Find the value of $g'$ when $f(x) = 8$.

**(3)** Write the equation of the line which is tangent to each of the following.

**(a)** $y = e^{-x}$ at $x = 0$

**(b)** $y = \sin^{-1}(4x)$ at $x = \frac{1}{8}$.

**(c)** $y = \ln\left(\sqrt[3]{x}\right)$ at $x = e^2$

**(d)** $\sin(3y) = \cos^{-1}(2x)$ at $\left(\frac{1}{2}, \pi\right)$

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**Answers**

**(1)** **(a)** $\frac{dy}{dx} = \frac{1}{\sqrt{2 - 2x}\,\sqrt{2x - 1}}$

**(b)** $\frac{dy}{dx} = \frac{-9x^2}{\sqrt{1 - x^6}}$

**(c)** $\frac{dy}{dx} = \frac{-3}{\sqrt{e^{6x} - 1}}$

**(d)** $\frac{dy}{dx} = \frac{2\ln(5x) + 2}{y}$

**(e)** $\frac{dy}{dx} = 2x\sin^{-1}\left(\sqrt{x}\right) + \frac{x^{\frac{3}{2}}}{2\sqrt{1 - x}}$

**(f)** $\frac{dy}{dx} = \frac{\sqrt{x}}{2(1 + x)}$

**(g)** $\frac{dy}{dx} = \ln^2\left(x^2\right) + 4\ln\left(x^2\right)$

**(h)** $\frac{dy}{dx} = \frac{13}{(2x - 1)(3x + 5)}$

**(i)** $\frac{dy}{dx} = e^{\sin(x)} + x\cos(x)\,e^{\sin(x)}$

**(j)** $\frac{dy}{dx} = \frac{2e^{2x}}{\sqrt{1 - e^{4x}}}$

**(k)** $\frac{dy}{dx} = \frac{1}{x\sqrt{x^2 - 1}}$

**(l)** $\frac{dy}{dx} = \sec^{-1}\left(\sqrt{x}\right)$

**(m)** $\frac{dy}{dx} = x^{\cos(x)}\left(\frac{\cos(x)}{x} - \sin(x)\ln(x)\right)$

**(n)** $\frac{dy}{dx} = \sec(x)$

**(o)** $\frac{dy}{dx} = \frac{1}{x\ln(10)}$

**(p)** $\frac{dy}{dx} = \cos^2(y)\left(e^x + \frac{1}{x}\right)$

**(2)** $\frac{1}{6}$

**(3)** **(a)** $y = -x + 1$

**(b)** $\left(y - \frac{\pi}{6}\right) = \frac{8}{\sqrt{3}}\left(x - \frac{1}{8}\right)$

**(c)** $y = \frac{1}{3e^2}x + \frac{1}{3}$

**(d)** $x = \frac{1}{2}$