Year 4 Mathematics 2
Differentiation
Supplementary Worksheet

Name : _____ ( ) Class : 4___ Date : _____

Chain Rule, Product Rule and Quotient Rule

1 Find $\frac{dy}{dx}$ for each of the following functions.

(a) $y = \sqrt{x+1}$

(b) $y = \sqrt{x^2+5}$

(c) $y = \frac{1}{\sqrt{x^2+1}}$

(d) $y = \sqrt[3]{3x-2}$

(e) $y = \frac{\pi}{3}(4-x)(4+x)^2$

(f) $y = x(1+x^2)^2$

(g) $y = x(2x-1)^7$

(h) $y = x\sqrt{1+x^2}$

(i) $y = \frac{3x+2}{x-2}$

(j) $y = \frac{x-2}{\sqrt{1-2x}}$

(k) $y = \frac{x-1}{\sqrt{2x-1}}$

(l) $y = \frac{2x-1}{x^2+1}$

Derivatives of Trigonometric Functions, Exponential Functions and Logarithmic Functions

2 Differentiate each of the following respect to x.

(a) $y = x^2 \tan 2x$

(b) $y = (2-x)^5 \sin 2x$

(c) $y = 3xe^{1-x}$

(d) $y = e^{-2x}(\sin x - \cos x)$

(e) $y = \frac{e^{2x}}{3x-1}$

(f) $y = \frac{\cos^2 x}{e^{2x}}$

(g) $y = \ln\sqrt{x^2+5}$

(h) $y = \ln\left(\frac{1}{\sqrt{2x^3-1}}\right)$

(i) $y = (1-x^3)^2 \ln 3x$

Miscellaneous Questions

3 Find the derivatives of the following

(a) $y = x^{-2/3}$ (b) $y = \sqrt[3]{x^7}$ (c) $y = \dfrac{1}{\sqrt[5]{x^2}}$

(d) $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}$ (e) $y = \dfrac{32\pi}{x} + \pi x^2$ (f) $y = \dfrac{8-2x}{x}$

(g) $y = \dfrac{5x-4}{x^2}$ (h) $y = \dfrac{150-2x^2}{3x}$ (i) $y = \dfrac{2x^2-3}{x}$

(j) $y = \dfrac{8-2x}{x}$ (k) $y = x^2\sqrt{5-x}$

4 Differentiate the following with respect to x

(a) $\dfrac{5-x}{2x}$ (b) $(2x^2 - 3x + 1)^5$ (c) $\dfrac{2}{3(x^2-5x)}$

(d) $\dfrac{1}{\sqrt[3]{5-3x}}$ (e) $(2x+3)^2\sqrt{1-4x}$ (f) $\dfrac{x-2}{\sqrt{1-2x}}$

(g) $\dfrac{1}{2\cos(3x-4)}$ (h) $2x\tan 3x$ (i) $3x^2\cos^3(2x+\dfrac{\pi}{3})$

(j) $e^{3x}\tan 2x$ (k) $\dfrac{e^{3x}+\sqrt[x]{e^3}}{e^{-x}}$ (l) $\ln\sqrt{\dfrac{(1-x)^3}{2x}}, 0 < x < 1$

Answers

1(a) $\dfrac{1}{2\sqrt{x+1}}$ (b) $\dfrac{x}{\sqrt{x^2+5}}$ (c) $-\dfrac{x}{\sqrt{\left(x^2+1\right)^3}}$

(d) $\dfrac{1}{\sqrt[3]{\left(3x-2\right)^2}}$ (e) $\dfrac{\pi\left(x+4\right)\left(4-3x\right)}{3}$ (f) $5x^4+6x^2+1$

(g) $\left(2x-1\right)^6\left(16x-1\right)$ (h) $\dfrac{2x^2+1}{\sqrt{x^2+1}}$ (i) $-\dfrac{8}{\left(x-2\right)^2}$

(j) $-\dfrac{x+1}{\left(1-2x\right)\sqrt{1-2x}}$ (k) $y=\dfrac{x}{\left(2x-1\right)\sqrt{2x-1}}$ (l) $\dfrac{2\left(1+x-x^2\right)}{\left(x^2+1\right)^2}$

2(a) $2x\tan 2x+2x^2\sec^2 2x$ (b) $\left(2-x\right)^4\left(-5\sin 2x+4\cos 2x-2x\cos 2x\right)$

(c) $3\mathrm{e}^{1-x}\left(1-x\right)$ (d) $\mathrm{e}^{-2x}\left(3\cos x-\sin x\right)$ (e) $\dfrac{\mathrm{e}^{2x}\left(6x-5\right)}{\left(3x-1\right)^2}$

(f) $-\dfrac{\sin 2x+2\cos^2 x}{\mathrm{e}^{2x}}$ (g) $\dfrac{x}{x^2+5}$ (h) $\dfrac{3x^2}{1-2x^3}$

(i) $\left(1-x^3\right)\left(-6x^2\ln 3x+\dfrac{1-x^3}{x}\right)$

3 (a) $-\dfrac{2}{3x^{5/3}}$ (b) $\dfrac{7}{3}x^{4/3}$ (c) $-\dfrac{2}{5x^{7/5}}$

(d) $\dfrac{x-1}{2x\sqrt{x}}$ (e) $\dfrac{2\pi\left(x^3-16\right)}{x^2}$ (f) $-\dfrac{8}{x^2}$

(g) $\dfrac{8-5x}{x^3}$ (h) $\dfrac{-150-2x^2}{3x^2}$ (i) $\dfrac{2x^2+3}{x^2}$

(j) $-\dfrac{8}{x^2}$ (k) $\dfrac{5x\left(4-x\right)}{2\sqrt{5-x}}$

4 (a) $\dfrac{-10}{4x^2}$ (b) $5(2x^2-3x+1)^4(4x-3)$ (c) $\dfrac{2(5-2x)}{3(x^2-5x)^2}$

(d) $\dfrac{1}{\sqrt[3]{(5-3x)^4}}$ (e) $-\dfrac{2(2x+3)(10x+1)}{\sqrt{1-4x}}$ (f) $-\dfrac{x+1}{\sqrt{(1-2x)^3}}$

(g) $\dfrac{3\sin(3x-4)}{2\cos^2(3x-4)}$ (h) $2(\tan 3x+3x\sec^2 3x)$

(i) $6x\cos^2(2x+\dfrac{\pi}{3})\left[\cos(2x+\dfrac{\pi}{3})-3x\sin(2x+\dfrac{\pi}{3})\right]$ (j) $\mathrm{e}^{3x}(3\tan 2x+2\sec^2 2x)$

(k) $\dfrac{2x+1}{2x(x-1)}$ (l) $4\mathrm{e}^{4x}+(1-\dfrac{3}{x^2})(\mathrm{e}^x)\sqrt[x]{\mathrm{e}^3}$