12.5) Differentiating functions with two or more terms

Worked example	Your turn
Differentiate with respect to x:	Differentiate with respect to x:
$y = 4x^3 + 3x^2 + 2x + 1$	$y = 5x^4 - 2x^7 + 12345 - x^5$
	$\frac{dy}{dx} = 20x^3 - 14x^6 - 5x^4$
$f(x) = x^3 - 2x^5 - 3x^{-2} - 2$	

Worked example	Your turn
Differentiate with respect to x:	Differentiate with respect to x:
$y = 2\sqrt{x} + 3x^{\frac{4}{3}} - \frac{1}{x} + \frac{5}{x^2}$	$y = 3\sqrt{x} + 4x^{\frac{5}{3}} - \frac{5}{x} + \frac{1}{\sqrt[3]{x}}$
	$\frac{dy}{dx} = \frac{3}{2}x^{-\frac{1}{2}} + \frac{20}{3}x^{\frac{2}{3}} + 5x^{-2} - \frac{1}{3}x^{-\frac{4}{3}}$
$f(x) = 4\sqrt[3]{x} + 2x^{\frac{1}{4}} - \frac{5}{x^3} + \frac{3}{\sqrt{x}} + 6x^{-2}$	

Worked example	Your turn
Differentiate with respect to x: $y = x^4(x-5)$	Differentiate with respect to x: $f(x) = x^2(x-3)$ $f'(x) = 3x^2 - 6x$
$f(x) = x^3(x+2)$	

Worked example	Your turn
Differentiate with respect to x: $y = \frac{(x+3)^2}{x}$	Differentiate with respect to x: $f(x) = \frac{(2x+3)^2}{5x}$
$f(x) = \frac{(3x-2)^2}{5x}$	$f'(x) = \frac{4}{5} - \frac{9}{5}x^{-2}$ $= \frac{4}{5} - \frac{9}{5x^2}$

Worked example

Differentiate with respect to x:

$$y = \frac{x^3 + 2}{\sqrt{x}}$$

$$f(x) = \frac{x^2 - 5}{\sqrt[3]{x}}$$

Your turn

Differentiate with respect to x:

$$f(x) = \frac{x^2 + 3}{\sqrt{x}}$$

$$f'(x) = \frac{3}{2}x^{\frac{1}{2}} - \frac{3}{2}x^{-\frac{3}{2}}$$

Worked example	Your turn
Differentiate with respect to x: $$y = \frac{(x+4)^3}{5x^2}$$	Differentiate with respect to x: $$y = \frac{(x+2)^3}{3x^2}$$ $$\frac{dy}{dx} = \frac{1}{3} - 4x^{-2} - \frac{16}{3}x^{-3}$$ $$= \frac{1}{3} - \frac{4}{x^2} - \frac{16}{3x^3}$$

Worked example	Your turn
Differentiate with respect to x: $$y = \frac{3 - 4x}{2x^2\sqrt{x}}$$	Differentiate with respect to x: $$y = \frac{1 + 2x}{3x\sqrt{x}}$$ $$\frac{dy}{dx} = -\frac{1}{2}x^{-\frac{5}{2}} - \frac{1}{3}x^{-\frac{3}{2}}$$