YEAR 1 DIFFERENTIATION ANSWERS - EDEXCEL

1.

(a) 4	B1	
(b) $16^{-\frac{3}{2}} = \frac{1}{16^{\frac{3}{2}}}$ and attempt to find $16^{\frac{3}{2}}$	M1	
$\frac{1}{64}$ (or exact equivalent, e.g. 0.015625)	A1	(3)
		3

2.

(a) $\frac{dy}{dx} = 4x + 18x^{-4}$	M1: $x^2 \to x$ or $x^{-3} \to x^{-4}$	M1 A1
		(2)

3.

$4x^3 \to kx^2$ or $2x^{\frac{1}{2}} \to kx^{-\frac{1}{2}}$	(k a non-zero constant)	M1
$12x^2, + x^{-\frac{1}{2}} \ldots\ldots,$	$(-1 \to 0)$	A1, A1, B1 (4)
		4

4.

(a) $\left(2x^{-\frac{1}{2}} + 3x^{-1}\right)$	$p = -\frac{1}{2}, \quad q = -1$	B1, B1 (2)
(b) $\left(y = 5x - 7 + 2x^{-\frac{1}{2}} + 3x^{-1}\right)$		
$\left(\frac{dy}{dx} =\right)$ 5 (or $5x^0$)	($5x - 7$ correctly differentiated)	B1
Attempt to differentiate either $2x^p$ with a fractional p, giving kx^{p-1} $(k \neq 0)$, (the fraction p could be in decimal form)		
or $3x^q$ with a negative q, giving kx^{q-1} $(k \neq 0)$.		M1
$\left(-\frac{1}{2} \times 2x^{-\frac{3}{2}} - 1 \times 3x^{-2} =\right)$ $-x^{-\frac{3}{2}}, -3x^{-2}$		A1ft, A1ft (4)
		6

5.

(a)	$2x^{3/2}$ or $p=\frac{3}{2}$ (Not $2x\sqrt{x}$)	B1
	$-x$ or $-x^1$ or $q=1$	B1 (2)
(b)	$\left(\frac{dy}{dx}=\right) 20x^3+2\times\frac{3}{2}x^{1/2}-1$	M1
	$=\underline{20x^3+3x^{\frac{1}{2}}-1}$	A1A1ftA1ft (4) [6]

6.

$x^4\to kx^3$ or $x^{1/3}\to kx^{-2/3}$ or $3\to 0$ (k a non-zero constant)	M1
$\left(\frac{dy}{dx}=\right)$ $4x^3$..... , with '3' differentiated to zero (or 'vanishing')	A1
$\left(\frac{dy}{dx}=\right)$ ..... $+\frac{1}{3}x^{-2/3}$ or equivalent, e.g. $\frac{1}{3\sqrt[3]{x^2}}$ or $\frac{1}{3\left(\sqrt[3]{x}\right)^2}$	A1 [3]

7.

(a)	$\left(\frac{dy}{dx}=\right)\frac{3}{2}x^2-\frac{27}{2}x^{\frac{1}{2}}-8x^{-2}$	M1A1A1A1 (4)
(b)	$x=4 \Rightarrow y=\frac{1}{2}\times 64-9\times 2^3+\frac{8}{4}+30$	M1
	$=32-72+2+30 \quad =\underline{-8}$ *	A1cso (2)
(c)	$x=4 \Rightarrow y'=\frac{3}{2}\times 4^2-\frac{27}{2}\times 2-\frac{8}{16}$	M1
	$=24-27-\frac{1}{2}= \quad -\frac{7}{2}$	A1
	Gradient of the normal $=-1\div"\frac{7}{2}"$	M1
	Equation of normal: $y--8=\frac{2}{7}(x-4)$	M1A1ft
	$\underline{7y-2x+64=0}$	A1 (6) 12