Diff and rates of change Answers

1)

9.	(i) $d/dx(\sqrt{(2x+5)} = \frac{1}{2} \times (2x+5)^{-\frac{1}{2}} \times 2$ $dy/dx = \sqrt{(2x+5)} + (x-5) \times$ "above ans" $\rightarrow k = 3$	M1 M1 A1 A1	Must have "×2" – ie fn of a fn. Must use product rule correctly – M mark is independent of first M mark.
	(ii) $\delta y \approx [dy/dx]_{x=10} \times \delta x = \pm 6p$	M1A1√	Needs numerical dy/dx - δx=±p, not 10-p for the M mark.
	(iii) $dy/dt = dy/dx \times dx/dt$ $\Rightarrow 3 = 6\ dx/dt \qquad dx/dt = 0.5$ unit/s	M1 A1 8	Use of chain rule – must be for 3=dy/dx. Correct only. Ignore units.

2)

10 (i)	$\frac{dy}{dx} = \frac{(x-2)2-(2x+4)1}{(x-2)^2} = \frac{-8}{(x-2)^2} \Rightarrow k = -8$ Must be correct formula for M mark (accept $\frac{-8}{(x-2)^2}$ as answer)	M1 A1
(ii)	When $y = 0$, $x = -2$ (B mark is for *one* solution only) NB. $x = 0$, $y = -2$	B1
	$m_{tangent} = -8/16 = -1/2 \Rightarrow m_{normal} = +2$ (M is for use of $m_1 m_2 = -1$, whether numeric or algebraic)	M1
	Equation of normal is $y - 0 = 2(x + 2)$ (candidate's m_{normal} and $[x]_{y=0}$ for M mark)	M1 A1
(iii)	When $y = 6$, $x = 4$	B1
	$\frac{dy}{dt} = \frac{dy}{dx} \times \frac{dx}{dt} = \frac{-8}{(x-2)^2} \times 0.05 = \frac{-8}{4} \times 0.05 = -0.1$ (accept $\pm$)	M1 A1√
	i.e. $\left[\frac{dy}{dx}\right]_{x=4}$ x 0.05 for M mark.	
[9]	√ is for error in k only. (Condone S $\approx \frac{dy}{dx}$ x S)	

3)

11 [10]	**(i)** $d/dx\ (2x-3)^{3/2} = (2x-3)^{1/2} \times 3/2 \times 2$	M1 A1
	$dy/dx = 1 \times (2x-3)^{3/2} + (x+1) \times \{$ candidate's $d/dx\ (2x-3)^{3/2} \}$	M1
	$= \sqrt{2x-3}\{(2x-3)+3(x+1)\} = 5x\sqrt{2x-3} \Rightarrow k = 5$	A1
	(ii) $\delta y \approx dy/dx \times \delta x = (dy/dx)_{x=6} \times p = 90p$	M1 A1
	$(y)_{x=6+p} = (y)_{x=6} + \delta y = 189 + 90p$	A1√

4)

1 (i) $dy/dx = (2x - 1)^{-2} \times (-8) \times 2$ **B3, 2, 1**

(ii) $dy/dt = [dy/dx]_{x=-0.5} \times dx/dt \Rightarrow 0.2 = -4 \times dx/dt \Rightarrow dx/dt = -0.05$ **M1 A1 [5]**

5)

(i) $12x - \frac{96}{x^4}$ oe B1+B1

(ii) uses $\partial y = \frac{dy}{dx} \times \partial x$ with $x = 2$ M1

Substitute $\partial x = 0.04$ DM1

0.72 A1

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