L6 Mock Teacher Y 19-20 SOLUTIONS [48]

1.

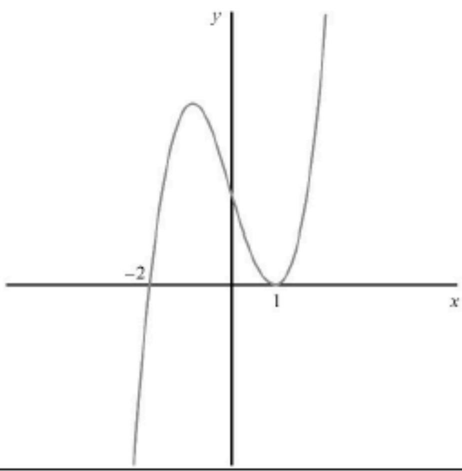
$2(x^2 - 6x) + x - 6 = 0$	M1*	Substitute for x/y to eliminate one of the variables	If x eliminated: $y = (6-2y)^2 - 6(6-2y)$
$2x^2 - 11x - 6 = 0$	A1	Correct 2/3-term quadratic in solvable form	$4y^2 - 13y = 0$
$(2x+1)(x-6) = 0$	M1* dep	Attempt to solve resulting quadratic. **See appendix 1.**	$y(4y-13) = 0$
$x = -\frac{1}{2}, x = 6$	A1	x values correct	**Spotted solutions:** If **M0 DM0** **SC B1** One correct pair **www**
$y = \frac{13}{4}, y = 0$	A1	y values correct Award **A1 A0** for one pair **correctly found from correctly factorised quadratic**	**SC B1** Second correct pair **www** Must show on both line and curve (Can then get 5/5 if both found **www** and exactly two solutions justified)
	[5]		

2.

States gradient of $4y - 3x = 10$ is $\frac{3}{4}$ oe or rewrites as $y = \frac{3}{4}x + \ldots$	B1	1.1b
Attempts to find gradient of line joining $(5,-1)$ and $(-1,8)$	M1	1.1b
$= \frac{-1-8}{5-(-1)} = -\frac{3}{2}$	A1	1.1b
States neither with suitable reasons	A1	2.4
	(4)	

(4 marks)

3.

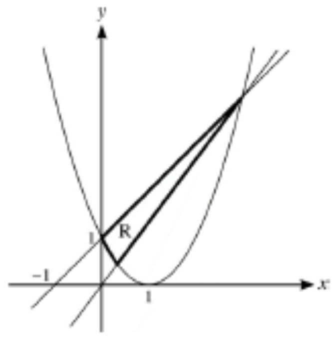
(a)	Draws a correctly orientated cubic graph with a max and a min	1.1a	M1	$g(x) = 0$ at -2 and 1 (twice) 
	Shows that the curve meets x-axis at –2 and 1 Ignore an additional cutting of the axis	1.1b	A1	
	Deduces the graph touches the x-axis at 1	2.2a	B1	
(b)	States correct lower region	2.5	B1	$x \le -2$
	Deduces that point value $x = 1$ solves the inequality	2.2a	B1	$x = 1$
	Total		**5**	

4.

(a)	Uses $18\sqrt{3}=\frac{1}{2}\times 2x\times 3x\times \sin 60°$	M1	1.1a
	Sight of $\sin 60°=\frac{\sqrt{3}}{2}$ and proceeds to $x^2=k$ oe	M1	1.1b
	$x=\sqrt{12}=2\sqrt{3}$ *	A1*	2.1
		(3)	
(b)	Uses $BC^2=\left(6\sqrt{3}\right)^2+\left(4\sqrt{3}\right)^2-2\times 6\sqrt{3}\times 4\sqrt{3}\times \cos 60°$	M1	1.1b
	$BC^2=84$	A1	1.1b
	$BC=2\sqrt{21}$ (cm)	A1	1.1b
		(3)	

(6 marks)

5.

	B1 B1 B1 B1 [4]	1.1 1.1 1.1 1.1	$y=(x-1)^2$ drawn correctly $3y=4x$ drawn correctly $y-x=1$ drawn correctly Correct identification of region (dependent on previous B marks); condone identification via shading so long as there is no ambiguity about the intended region	x-axis must be a tangent to the curve Line must pass through the origin Positive gradient and y-intercept Note that both lines and curve must meet at the same point for this final mark to be awarded (ignore labelling on axes)

6.

(a)	2^6 or 64 as the constant term	B1	1.1b
	$\left(2+\frac{3x}{4}\right)^6=\ldots+{}^6C_1 2^5\left(\frac{3x}{4}\right)^1+{}^6C_2 2^4\left(\frac{3x}{4}\right)^2+\ldots$ $=\ldots+6\times 2^5\left(\frac{3x}{4}\right)^1+\frac{6\times 5}{2}\times 2^4\left(\frac{3x}{4}\right)^2+\ldots$	M1 A1	1.1b 1.1b
	$=64+144x+135x^2+\ldots$	A1	1.1b
		(4)	
(b)	$\frac{3x}{4}=-0.075\Rightarrow x=-0.1$ So find the value of $64+144x+135x^2$ with $x=-0.1$	B1ft	2.4
		(1)	

(5 marks)

7.

(a)	Attempts to complete the square $(x\pm 3)^2+(y\pm 5)^2=...$	M1
	(i) Centre $(3,-5)$	A1
	(ii) Radius 5	A1
		(3)
(b)	Uses a sketch or otherwise to deduce $k=0$ is a critical value	B1
	Substitute $y=kx$ in $x^2+y^2-6x+10y+9=0$	M1
	Collects terms to form correct 3TQ $(1+k^2)x^2+(10k-6)x+9=0$	A1
	Attempts $b^2-4ac...0$ for their *a*, *b* and *c* leading to values for *k* $''(10k-6)^2-36(1+k^2)...0'' \rightarrow k=...,...$ $\left(0 \text{ and } \frac{15}{8}\right)$	M1
	Uses $b^2-4ac>0$ and chooses the outside region (see note) for **their** critical values (Both *a* and *b* must have been expressions in *k*)	dM1
	Deduces $k<0, k>\frac{15}{8}$ oe	A1
		(6)

(9 r

8.

1 (a)	Attempts $f(4)=2\times 4^3-13\times 4^2+8\times 4+48$	M1	1.1b
	$f(4)=0 \Rightarrow (x-4)$ is a factor	A1	1.1b
		(2)	
(b)	$2x^3-13x^2+8x+48=(x-4)(2x^2...x-12)$	M1	2.1
	$=(x-4)(2x^2-5x-12)$	A1	1.1b
	Attempts to factorise quadratic factor or solve quadratic eqn	dM1	1.1b
	$f(x)=(x-4)^2(2x+3) \Rightarrow f(x)=0$ has only two roots, 4 and -1.5	A1	2.4
		(4)	
(c)	Deduces either three roots or deduces that $f(x)$ is moved down two units	M1	2.2a
	States three roots, as when $f(x)$ is moved down two units there will be three points of intersection (with the x - axis)	A1	2.4
		(2)	
(d)	For sight of $k=\pm 4, \pm\frac{3}{2}$	M1	1.1b
	$k=4, -\frac{3}{2}$	A1ft	1.1b
		(2)	
			(10 marks)