1(a)

Write as $y^2 = \frac{x^2}{x^{\frac{1}{2}}}$ and since $x > 0$,

$$y = \frac{x}{\left(x-\frac{1}{2}\right)^{\frac{1}{2}}}$$ M1

$$\frac{dy}{dx} = \frac{\left(x-\frac{1}{2}\right)^{\frac{1}{2}} \times 1 - x \times \frac{1}{2}\left(x-\frac{1}{2}\right)^{-\frac{1}{2}}}{\left(\left(x-\frac{1}{2}\right)^{\frac{1}{2}}\right)^2}$$ M1

$$\frac{dy}{dx} = \frac{(x-1)}{2\left(x-\frac{1}{2}\right)^{\frac{3}{2}}}$$ M1

Let P be a generic point on the curve for which $y > 0$ M1
Then,
$$\frac{dy}{dx}\Big|_{x=P} = \frac{P-1}{2\left(P-\frac{1}{2}\right)^{\frac{3}{2}}}$$

Equation of tangent at P takes the form, M1
$$y - \frac{P}{\left(P-\frac{1}{2}\right)^{\frac{1}{2}}} = \frac{P-1}{2\left(P-\frac{1}{2}\right)^{\frac{3}{2}}}(x-P)$$

Substitute $x = \frac{1}{2}$ and $y = \sqrt{2}$ M1
$$\sqrt{2} - \frac{P}{\left(P-\frac{1}{2}\right)^{\frac{1}{2}}} = \frac{P-1}{2\left(P-\frac{1}{2}\right)^{\frac{3}{2}}}\left(\frac{1}{2}-P\right)$$

$$\sqrt{2} - \frac{P}{\left(P-\frac{1}{2}\right)^{\frac{1}{2}}} = \frac{1-P}{2\left(P-\frac{1}{2}\right)^{\frac{1}{2}}}$$ M1

$$2\sqrt{2}\left(P-\frac{1}{2}\right)^{\frac{1}{2}} - 2P = 1-P$$ M1

$$8\left(P-\frac{1}{2}\right) = P^2 + 2P + 1$$ M1

$P^2 - 6P + 5 = 0$ M1
$(P-1)(P-5) = 0$
$P = 1$ or 5

Hence, two tangents in the form A1
$$y - \frac{P}{\left(P-\frac{1}{2}\right)^{\frac{1}{2}}} = \frac{P-1}{2\left(P-\frac{1}{2}\right)^{\frac{3}{2}}}(x-P)$$
where $P = 1$ or 5 [11]

1(b)	Substitutes $P = 1$, $y - \frac{1}{\left(1-\frac{1}{2}\right)^{\frac{1}{2}}} = \frac{1-1}{2\left(1-\frac{1}{2}\right)^{\frac{3}{2}}}(x-1)$	M1
	$y - \sqrt{2} = 0$	A1
	Substitutes $P = 5$, $y - \frac{5}{\left(5-\frac{1}{2}\right)^{\frac{1}{2}}} = \frac{5-1}{2\left(5-\frac{1}{2}\right)^{\frac{3}{2}}}(x-5)$	M1
	$y - \frac{5\sqrt{2}}{3} = \frac{4}{\left(\frac{27}{\sqrt{2}}\right)}(x-5)$	M1
	$4\sqrt{2}x - 27y + 25\sqrt{2} = 0$ or $8x - 27\sqrt{2}y + 50 = 0$	A1 **[5]** **[16 marks]**