[2] $\cosh 4x = \cosh 2(2x)$

$$= \underline{2\cosh^2 2x - 1} \quad 8$$

$$= \underline{2(2\sinh^2 x + 1)^2 - 1} \quad 12$$

$$= 2(4\sinh^4 x + 4\sinh^2 x + 1) - 1$$

$$= \underline{8\sinh^4 x + 8\sinh^2 x + 1} \quad 5$$

[2] $\cosh 4x = \cosh 2(2x)$

ALTERNATE SOLUTION

$= \underline{2\sinh^2 2x + 1}$ 6

$= \underline{2(2\sinh x \cosh x)^2 + 1}$ 6

$= \underline{8\sinh^2 x \cosh^2 x + 1}$ 2

$= \underline{8\sinh^2 x(\sinh^2 x + 1) + 1}$ 6

$= \underline{8\sinh^4 x + 8\sinh^2 x + 1}$ 5

ALTERNATE SOLUTION

$$
\begin{aligned}
[2] \quad \cosh 4x &= \cosh 2(2x) \\
&= \cosh^2 2x + \sinh^2 2x \quad 6 \\
&= (2\sinh^2 x + 1)^2 + (2\sinh x \cosh x)^2 \quad 6 \\
&= 4\sinh^4 x + 4\sinh^2 x + 1 + 4\sinh^2 x \cosh^2 x \quad 2 \\
&= 4\sinh^4 x + 4\sinh^2 x + 1 + 4\sinh^2 x(\sinh^2 x + 1) \quad 6 \\
&= 4\sinh^4 x + 4\sinh^2 x + 1 + 4\sinh^4 x + 4\sinh^2 x \\
&= 8\sinh^4 x + 8\sinh^2 x + 1 \quad 5
\end{aligned}
$$

[3] [a] $\underline{3\left(\frac{e^x-e^{-x}}{2}\right)-2\left(\frac{e^x+e^{-x}}{2}\right)} = \frac{3}{2}e^x - \frac{3}{2}e^{-x} - e^x - e^{-x}$

5 $\quad = \underline{\frac{1}{2}e^x - \frac{5}{2}e^{-x}}$ 5

[b] $\frac{1}{2}e^x - \frac{5}{2}e^{-x} = 3$

$e^x - 5e^{-x} = 6 \qquad \text{LET } z = e^x > 0$

$\underline{z - \frac{5}{z} = 6}$ 11

$z^2 - 5 = 6z$

$\underline{z^2 - 6z - 5 = 0}$ 6 $\longrightarrow z = \frac{6 \pm \sqrt{36+20}}{2} = \underline{\frac{6 \pm \sqrt{56}}{2}}$ 6

$= \frac{6 \pm 2\sqrt{14}}{2} = \underline{3 \pm \sqrt{14}}$ 3

$\sqrt{14} > 3 \longrightarrow 3 - \sqrt{14} < 0$

$e^x = z = \underline{3 + \sqrt{14}}$ 3

$x = \underline{\ln(3+\sqrt{14})}$ 6

[4] $\underline{2r^2\sin^2\theta + 3r\sin\theta = 3r\cos\theta - 2r^2\cos^2\theta}$ (5) - SUBSTITUTE $x = r\cos\theta$, $y = r\sin\theta$ AND SIMPLIFY

$\underline{2r\sin^2\theta + 3\sin\theta = 3\cos\theta - 2r\cos^2\theta}$ (3) - CANCEL r

$\underline{2r\sin^2\theta + 2r\cos^2\theta = 3\cos\theta - 3\sin\theta}$ (3) - COLLECT r TERMS

(3) $\underline{2r(\sin^2\theta + \cos^2\theta)} = 3(\cos\theta - \sin\theta)$

FACTOR r

(3) $\underline{2r} = 3(\cos\theta - \sin\theta)$

INVOKE PYTHAGOREAN IDENTITY

(3) $\underline{r = \frac{3}{2}(\cos\theta - \sin\theta)}$

[5] $\theta = \frac{\pi}{2}$: $(r, \pi - \theta)$ $\underline{r = 3\cos 2(\pi-\theta) - \sin(\pi - \theta)}$ 3

$r = 3\cos(2\pi - 2\theta) - (\overset{0}{\cancel{\sin\pi}}\cos\theta - \overset{-1}{\cancel{\cos\pi}}\sin\theta)$

$r = 3(\overset{1}{\cancel{\cos 2\pi}}\cos 2\theta + \overset{0}{\cancel{\sin 2\pi}}\sin 2\theta) - \sin\theta$

$r = \underline{3\cos 2\theta}\ \underline{- \sin\theta}$ SYM OVER $\theta = \frac{\pi}{2}$

3 3 3

POLAR AXIS: $(r, -\theta)$ $\underline{r = 3\cos 2(-\theta) - \sin(-\theta)}$ 3

$r = 3\cos(-2\theta) + \sin\theta$

$r = \underline{3\cos 2\theta}$ 2 $\underline{+\sin\theta}$ 2 NO CONCLUSION

$(-r, \pi - \theta)$ $\underline{-r = 3\cos 2(\pi - \theta) - \sin(\pi - \theta)}$ 3

2 $\underline{-r = 3\cos 2\theta - \sin\theta}$ [FROM ABOVE]

$1\frac{1}{2}$ $\underline{r = -3\cos 2\theta + \sin\theta}$ NO CONCLUSION

3 NO CONCLUSION ABOUT SYM OVER POLAR AXIS

POLE: $(-r, \theta)$ 3 $\underline{-r = 3\cos 2\theta - \sin\theta}$

$1\frac{1}{2}$ $\underline{r = -3\cos 2\theta + \sin\theta}$ NO CONCLUSION

$(r, \pi + \theta)$ 3 $\underline{r = 3\cos 2(\pi + \theta) - \sin(\pi + \theta)}$

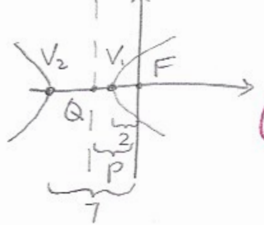
$r = 3\cos(2\pi + 2\theta) - (\overset{0}{\cancel{\sin\pi}}\cos\theta + \overset{-1}{\cancel{\cos\pi}}\sin\theta)$

$r = 3(\overset{1}{\cancel{\cos 2\pi}}\cos 2\theta - \overset{0}{\cancel{\sin 2\pi}}\sin 2\theta) + \sin\theta$

$r = \underline{3\cos 2\theta}$ 3 $\underline{+\sin\theta}$ 3 NO CONCLUSION

3 NO CONCLUSION ABOUT SYM OVER POLE

[6]



$$r = \frac{ep}{1 - e\cos\theta} = \frac{\cancel{\frac{9}{5}}\,\frac{28}{\cancel{9}}}{1 - \frac{9}{5}\cos\theta} \cdot \frac{5}{5} = \frac{28}{5 - 9\cos\theta}$$

9 5 4

$$e = \frac{V_1F}{V_1Q} = \frac{V_2F}{V_2Q}$$

$$e = \frac{2}{p-2} = \frac{7}{7-p}$$

9

$$14 - 2p = 7p - 14$$

$$28 = 9p$$

$$p = \frac{28}{9}$$

5

$$e = \frac{2}{\frac{28}{9} - 2} \cdot \frac{9}{9} = \frac{18}{28-18} = \frac{18}{10} = \frac{9}{5}$$

3