

4(a)	$y = 2x + 1 \Rightarrow x = \frac{1}{2}(y - 1)$
	$\frac{1}{16}(y-1)^4 + \frac{1}{8}(y-1)^3 + \frac{1}{4}(y-1)^2 + \frac{1}{2}(y-1) + 1 = 0$ $\frac{1}{16}(y^4 - 4y^3 + 6y^2 - 4y + 1) + \frac{1}{8}(y^3 - 3y^2 + 3y - 1) + \frac{1}{4}(y^2 - 2y + 1) + \frac{1}{2}(y - 1) + 1 = 0$
	$\frac{1}{16}y^4 - \frac{1}{8}y^3 + \frac{1}{4}y^2 + \frac{1}{8}y + \frac{11}{16} = 0 \Rightarrow y^4 - 2y^3 + 4y^2 + 2y + 11 = 0$
4(b)	$S_2 = 2^2 - 2(4)$
	$S_2 = -4$
4(c)	$S_4 - 2S_3 + 4S_2 + 2S_1 + 44 = 0$
	$S_4 = -76$

2(a)	$b = -(\alpha + \beta + \gamma) = -2$
	$3 = (-2)^2 - 2c$
	$c = \frac{1}{2}$
2(b)	$S_3 + bS_2 + cS_1 + 3d = 0$
	$S_3 = -3b - 2c - 3d = 5 - 3d$
	$S_4 + bS_3 + cS_2 + dS_1 = 0$
	$5 + (-2)(5 - 3d) + \left(\frac{1}{2}\right)(3) + 2d = 0 \Rightarrow 8d - \frac{7}{2} = 0$
	$d = \frac{7}{16}$

2(a)	$\alpha = -d$
	$\alpha + \beta + \frac{1}{\beta} = -b$
	$\beta + \frac{1}{\beta} = d - b$
2(b)	$-d\beta + 1 - \frac{d}{\beta} = c$
	$\beta + \frac{1}{\beta} = \frac{1-c}{d}$
2(c)(i)	$d - 3 = \frac{1+3}{d} \Rightarrow d^2 - 3d - 4 = 0$
	$d = 4$
2(c)(ii)	$\alpha^2 + \beta^2 + \gamma^2 = b^2 - 2c$
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2(a)	$y = x^3 - 1$
	$(y+1)^{\frac{3}{3}} + 2(y+1)^{\frac{1}{3}} + 1 = 0 \Rightarrow 2(y+1)^{\frac{1}{3}} = -y - 2$
	$8(y+1) = -(y+2)^3 \Rightarrow 8y+8 = -y^3 - 6y^2 - 12y - 8$
	$y^3 + 6y^2 + 20y + 16 = 0$
2(b)	$(\alpha^3 - 1)^2 + (\beta^3 - 1)^2 + (\gamma^3 - 1)^2 = 6^2 - 2(20)$
	-4
2(c)	$(\alpha^3 - 1)^3 + (\beta^3 - 1)^3 + (\gamma^3 - 1)^3 = -6(-4) - 20(-6) - 16(3)$
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3(a)	$0 = \alpha^2 + \beta^2 + \gamma^2 + \delta^2 + 2(7)$
	$\alpha^2 + \beta^2 + \gamma^2 + \delta^2 = -14$
3(b)	$S_4 + 7S_2 + 3S_1 + 88 = 0$
	$S_4 = 10$

3(c)

$$(r + \alpha^2)^2 = r^2 + 2\alpha^2 r + \alpha^4$$

$$\sum_{r=1}^{10} \left((r + \alpha^2)^2 + (r + \beta^2)^2 + (r + \gamma^2)^2 + (r + \delta^2)^2 \right)$$

$$= \sum_{r=1}^{10} (4r^2 - 28r + 10)$$

$$= 4\left(\frac{10}{6}(10+1)(2(10)+1)\right) - 14(10)(10+1)$$

$$+ 10(10)$$

$$= 100$$