1 $f(x) = -3(x+2)^2 + 11$

Vertex $(-2, 11)$, Axis $x = -2$, $\mathrm{Dom}\, f = (-\infty, \infty)$,
$\mathrm{Ran}\, f = (-\infty, 11]$

2

$$\begin{array}{r|rrrr} 3 & 1 & 1 & -11 & -10 \\ & & 3 & 12 & 3 \\ \hline & 1 & 4 & 1 & -7 \end{array}$$

Ans: $x^2 + 4x + 1 - \frac{7}{x-3}$

3

$$\begin{array}{r|rrrr|r} -1 & 8 & -14 & -29 & -4 & 3 \\ & & -8 & 22 & 7 & -3 \\ \hline & 8 & -22 & -7 & 3 & 0 \end{array}$$

So $f(x) = (x+1)(8x^3 - 22x^2 - 7x + 3)$

$$\begin{array}{r|rrr|r} 3 & 8 & -22 & -7 & 3 \\ & & 24 & 6 & -3 \\ \hline & 8 & 2 & -1 & 0 \end{array}$$

So $f(x) = (x+1)(x-3)(8x^2 + 2x - 1) \Rightarrow$
$f(x) = (x+1)(x-3)(4x-1)(2x+1)$
Zeros of f are: $-1, 3, 1/4, -1/2$ ✓

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4 Possible Rational Zeros: $\pm 1, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}$

$$\begin{array}{r|rrr|r} -1 & 2 & -9 & -6 & 5 \\ & \downarrow & -1 & 11 & -5 \\ \hline & 2 & -11 & 5 & 0 \end{array}$$

$f(x) = (x+1)(2x^2 - 11x + 5) = (x+1)(2x-1)(x-5)$
Zeros of f are: $-1, 1/2, 5$

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5 Need $-1+3i$ to be a zero also, so:
$f(x) = c(x-3)(x-1)[x-(-1-3i)][x-(-1+3i)]$
$= c(x^2 - 4x + 3)(x^2 + 2x + 10)$
$= c(x^4 - 2x^3 + 5x^2 - 34x + 30)$
Now, $f(2) = -36$ is required, and we have:
$f(2) = c(2^4 - 2\cdot 2^3 + 5\cdot 2^2 - 34\cdot 2 + 30) = -18c$.
Thus we need $-18c = -36$, or $c = 2$
So $f(x) = 2x^4 - 4x^3 + 10x^2 - 68x + 60$ ✓

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6 So $f(x) = (x-4)^2[x-(1+i)][x-(1-i)] \Rightarrow$
$f(x) = x^4 - 10x^3 + 34x^2 - 48x + 32$

7a $4^{3-y} = 4^{2y} \Rightarrow 3 - y = 2y \Rightarrow y = 1$

7b $c^5 = 5 \Rightarrow c = \sqrt[5]{5}$

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8 $A = 35{,}000\left(1 + \frac{0.089}{4}\right)^{4(7)} = \$64{,}813.78$

9a $6^x = \frac{1}{216} \Rightarrow 6^x = 6^{-3} \Rightarrow x = -3$

9b $x^{2/3} = 16^{1/3} \Rightarrow x = 4$

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10 $\log_9(13r^2) - \log_9 h$
$\log_9 13 + 2\log_9 r - \log_9 h$

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11 $\log_5\left(\frac{a^5}{c^{28}}\right)$