Section 1.3
Solutions and Hints

by Brent M. Dingle

for the book:

<u>Precalculus, Mathematics for Calculus 4th Edition</u>
by James Stewart, Lothar Redlin and Saleem Watson.

2. $(3x^2 + x + 1) - (2x^2 - 3x - 5)$

$$\begin{array}{lll} 3x^2 & +x & +1 \\ -2x^2 & +3x & +5 \\ \hline \mathbf{x^2} & \mathbf{+\ 4x} & \mathbf{+\ 6} \end{array}$$

8. $5(3t - 4) - (t^2 + 2) - 2t(t - 3)$

$$\begin{array}{lll} 0t^2 & +15t & -20 \\ -t^2 & +0t & -2 \\ -2t^2 & +6t & +0 \\ \hline \mathbf{-3t^2} & \mathbf{+21t} & \mathbf{-22} \end{array}$$

19. $(2x^2 + 3y^2)^2$

$$\begin{aligned}(2x^2 + 3y^2) * (2x^2 + 3y^2) &= 2x^2*2x^2 + 2x^2*3y^2 + 3y^2*2x^2 + 3y^2*3y^2 \\ &= 4x^4 + 6x^2y^2 + 6y^2x^2 + 9y^4 \\ &= \mathbf{4x^4 + 12x^2y^2 + 9y^4}\end{aligned}$$

31. $(1 + x^{4/3})(1 - x^{2/3})$

$$\begin{aligned}(1 + x^{4/3})(1 - x^{2/3}) &= 1*1 - 1*x^{2/3} + x^{4/3}*1 - x^{4/3}*x^{2/3} \\ &= 1 - x^{2/3} + x^{4/3} - x^{4/3 + 2/3} \\ &= \mathbf{1 - x^{2/3} + x^{4/3} - x^2}\ .\end{aligned}$$

48. Factor $6 + 5t - 6t^2$

(____ – ___t) (___ + ___ t)   Use a + and – because negative in front of t^2

(3 – ___t) (2 + ___t)   Guess which factors of 6 to use where

(3 – 2t) (2 + 3t)   Again guess and check for factors of 6t

Multiply out gives:

$$
\begin{aligned}
(3 - 2t)(2 + 3t) &= 3*2 + 3*3t - 2t*2 - 2t*3t \\
&= 6 + 9t - 4t - 6t^2 \\
&= 6 + 5t - 6t^2
\end{aligned}
$$

So **(3 – 2t) (2 + 3t)** is the answer.

57. Factor out completely: $(a + b)^2 - (a - b)^2$

For this one it is best to multiply stuff out first:

$$
\begin{aligned}
(a + b)^2 - (a - b)^2 &= a^2 + 2ab + b^2 - (a^2 - 2ab + b^2) \\
&= a^2 + 2ab + b^2 - a^2 + 2ab - b^2 \\
&= 2ab + 2ab \\
&= \mathbf{4ab}
\end{aligned}
$$

66. Factor out completely: $27a^3 + b^6$

Notice $3^3 = 27$, so 3a is likely to work somehow as is b^2 – as things will get cubed.

So try to divide out $(3a + b^2)$ and see what happens.

You should get $9a^2 - 3ab^2 + b^4$ – does this factor? No.

So the answer is: $\mathbf{(3a + b^2)(9a^2 - 3ab^2 + b^4)}$

79. Factor out completely: $x^{5/2} - x^{1/2}$

Take an $x^{1/2}$ out first.

$$
\begin{aligned}
x^{5/2} - x^{1/2} &= x^{1/2}(x^{4/2} - 1) \\
&= x^{1/2}(x^2 - 1) \\
&= \mathbf{x^{1/2}(x - 1)(x + 1)}
\end{aligned}
$$

86. Factor out completely: $(a^2 + 2a)^2 - 2(a^2 + 2a) - 3$

You could multiply everything out and try it that way.
Instead I would
let $x = (a^2 + 2a)$, so you get:

$(a^2 + 2a)^2 - 2(a^2 + 2a) - 3$ $= x^2 - 2x - 3$ *which is easier to factor*

$= (x - 3)(x + 1)$

and put the $(a^2 + 2a)$ back in for x

$= ((a^2 + 2a) - 3)\ ((a^2 + 2a) + 1)$

$= (a^2 + 2a - 3)\ (a^2 + 2a + 1)$ *which both factor*

$\mathbf{= (a - 1)(a + 3)\ (a + 1)(a + 1)}$

89. Factor out completely: $3(2x - 1)^2(2)(x+3)^{1/2} + (2x - 1)^3(1/2)(x + 3)^{-1/2}$

Take out an $(x+3)^{1/2}$ and multiply the 3 and the 2

$= (x + 3)^{1/2} * [\ 6(2x - 1)^2*(1) + (1/2)(2x - 1)^2(2x - 1)(x + 3)^{-1}\ ]$

Take out a $(2x - 1)^2$

$= (x + 3)^{1/2} * (2x - 1)^2 * [\ 6 + (1/2)(2x - 1) / (x + 3)\ ]$

Get a common denominator

$= (x + 3)^{1/2} * (2x - 1)^2 * [\ 6(x + 3) + (1/2)(2x - 1)] / (x + 3)$

$= (x + 3)^{1/2} * (2x - 1)^2 * [\ 6x + 18 + x - 1/2] / (x + 3)$

$= (x + 3)^{1/2} * (2x - 1)^2 * (7x + 35/2\ ) / (x + 3)$

$= (x + 3)^{1/2} * (2x - 1)^2 * (7x + 35/2\ )*(x + 3)^{-1}$

$\mathbf{= (x + 3)^{-1/2} * (2x - 1)^2 * (7x + 35/2\ )}$