2. (2 pts) $\int 6t^7 - 4t^{-3} + t^{\frac{3}{4}}\,dt = \frac{6}{8}t^8 + \frac{4}{2}t^{-2} + \frac{4}{7}t^{\frac{7}{4}} + c = \boxed{\frac{3}{4}t^8 + 2t^{-2} + \frac{4}{7}t^{\frac{7}{4}} + c}$

5. (2 pts) $\int (1-y)(y^3+3)\,dy = \int y^3 + 3 - y^4 - 3y\,dy = \boxed{\frac{1}{4}y^4 + 3y - \frac{1}{5}y^5 - \frac{3}{2}y^2 + c}$

8. (3 pts) $u = 1 + 4\mathbf{e}^{x^2} \qquad du = 8x\mathbf{e}^{x^2}dx \qquad x\mathbf{e}^{x^2}dx = \frac{1}{8}du$

$$\int x\mathbf{e}^{x^2}\sqrt[3]{1+4\mathbf{e}^{x^2}}\,dx = \frac{1}{8}\int u^{\frac{1}{3}}\,du = \left(\frac{1}{8}\right)\left(\frac{3}{4}\right)u^{\frac{4}{3}} + c = \boxed{\frac{3}{32}\left(1+4\mathbf{e}^{x^2}\right)^{\frac{4}{3}} + c}$$

11. (3 pts) $u = \sin(2x) \qquad du = 2\cos(2x)\,dx \qquad \cos(2x)\,dx = \frac{1}{2}du$

$$\int \cos(2x)\left[\sin^2(2x) - 5\sin(2x) + 3\right]dx = \frac{1}{2}\int u^2 - 5u + 3\,du = \frac{1}{2}\left(\frac{1}{3}u^3 - \frac{5}{2}u^2 + 3u\right) + c$$
$$= \frac{1}{2}\left(\frac{1}{3}\sin^3(2x) - \frac{5}{2}\sin^2(2x) + 3\sin(2x)\right) + c$$
$$= \boxed{\frac{1}{6}\sin^3(2x) - \frac{5}{2}\sin^2(2x) + \frac{3}{2}\sin(2x) + c}$$

Not Graded

1. (a) $\int 11x^7 + 2x^{-4} + 3\,dx = \boxed{\frac{11}{8}x^8 - \frac{2}{3}x^{-3} + 3x + c}$

(b) $\int 11x^7dx + 2x^{-4} + 3 = \frac{11}{8}x^8 + c + 2x^{-4} + 3 = \boxed{\frac{11}{8}x^8 + 2x^{-4} + 3 + c}$

3. $\int \frac{1}{7}\frac{1}{w} + 3w^{-6} + 2\,dw = \boxed{\frac{1}{7}\ln|w| - \frac{3}{5}w^{-5} + 2w + c}$

4. $\int 3\cos(x) - 10\sec^2(x)\,dx = \boxed{3\sin(x) - 10\tan(x) + c}$

6. $\int x^{-\frac{1}{2}} - \frac{4}{x^2+1} - 7\mathbf{e}^x\,dx = \boxed{2x^{\frac{1}{2}} - 4\tan^{-1}(x) - 7\mathbf{e}^x + c}$

7. The first derivative is,

$$f'(x) = \int f''(x)\,dx = \int 60x^3 - 12x^2 + 2x^{-\frac{3}{2}}\,dx = 15x^4 - 4x^3 - 4x^{-\frac{1}{2}} + c$$

Integrating again gives the most general form of the function.

$$f(x) = \int f'(x)\,dx = \int 15x^4 - 4x^3 - 4x^{-\frac{1}{2}} + c\,dx = 3x^5 - x^4 - 8x^{\frac{1}{2}} + cx + d$$

Plugging in the two known values gives the following system that we can solve for *c* and *d*.

$$\begin{aligned} -10 &= f(1) = -6 + cx + d \\ 2760 &= f(4) = 2800 + 4x + d \end{aligned} \quad \Rightarrow \quad \begin{aligned} -4 &= c + d \\ -40 &= 4c + d \end{aligned} \quad \Rightarrow \quad \begin{aligned} c &= -12 \\ d &= 8 \end{aligned}$$

The function is then,

$$\boxed{f(x) = 3x^5 - x^4 - 8x^{\frac{1}{2}} - 12x + 8}$$

9. $u = 1 - 2w \qquad du = -2dw \qquad dw = -\frac{1}{2}du$

$$\int \csc(1-2w)\cot(1-2w)\,dw = -\tfrac{1}{2}\int \csc(u)\cot(u)\,du = \tfrac{1}{2}\csc(u) = \boxed{\tfrac{1}{2}\csc(1-2w) + c}$$

10. $u = 10z - 7 \qquad du = 10dz \qquad dz = \frac{1}{10}du$

$$\int \frac{1}{(10z-7)^3} + \frac{4}{10z-7}\,dz = \frac{1}{10}\int u^{-3} + \frac{4}{u}\,du = \frac{1}{10}\left(-\frac{1}{2}u^{-2} + 4\ln|u|\right) + c$$

$$= \boxed{-\frac{1}{12}\frac{1}{(10z-7)^2} + \frac{2}{5}\ln|10z-7| + c}$$

12. In this case the first term doesn't need any substitution while the second does so we'll need to split the integral up and then do a substitution for the second integral/term.

$$\int \sqrt{y} + \sec^2(y)\,\mathbf{e}^{\tan(y)}\,dy = \int y^{\frac{1}{2}}\,dy + \int \sec^2(y)\,\mathbf{e}^{\tan(y)}\,dy$$

$$u = \tan(y) \qquad du = \sec^2(y)\,du$$

$$\int \sqrt{y} + \sec^2(y)\,\mathbf{e}^{\tan(y)}\,dy = \int y^{\frac{1}{2}}\,dy + \int \mathbf{e}^{u}\,du = \tfrac{2}{3}y^{\frac{3}{2}} + \mathbf{e}^{u} + c = \boxed{\tfrac{2}{3}y^{\frac{3}{2}} + \mathbf{e}^{\tan(y)} + c}$$