To go: 7.1, 7.2, and 7.4 (Read!!)

$\underbrace{7.1}_{\text{today}}$, $\underbrace{7.2}_{\text{substitution}}$, and $\underbrace{7.4}_{\text{integration by parts}}$

a) $\int x^2 + \pi x^{1/2} - 3\,dx$

b) $\int e^{2x} - 3\cos(2x) + \frac{1}{x^3}\,dx$

c) $\int t^{3/2} - e^{2t} + \sin(4t)\,dt$

d) $\int \sin\left(\frac{3}{2}q\right) + \cos(\pi q)\,dq$

e) $\int \frac{2}{x} + \frac{x}{x^{1/3}} + \cos(-x)\,dx$

F) $\int (x^2+1)(x^3-x)\,dx$

a) $\int x^2+\pi x^{1/2}-3\,dx$

$= \boxed{\int x^2\,dx} + \pi \boxed{\int x^{1/2}\,dx} - \boxed{\int 3\,dx}$

$= \frac{x^{2+1}}{2+1} + \pi \frac{x^{1/2+1}}{1/2+1} - 3x + C$

$= \boxed{\frac{1}{3}x^3 + \frac{2}{3}\pi x^{3/2} - 3x + C}$

b) $\int e^{2x} - 3\cos(2x) + \frac{1}{x^3}\,dx$

$= \int e^{2x}\,dx - 3\int \cos(2x)\,dx + \int x^{-3}\,dx$

$= \frac{1}{2}e^{2x} - 3\cdot\frac{1}{2}\sin(2x) + \frac{x^{-3+1}}{-3+1} + C$

$= \boxed{\frac{1}{2}e^{2x} - \frac{3}{2}\sin(2x) - \frac{1}{2}x^{-2} + C}$

$\boxed{\int e^{ax}\,dx = \frac{1}{a}e^{ax} + C}$

$\boxed{\int x^r\,dx = \frac{x^{r+1}}{r+1} + C \qquad r \neq -1}$

$\boxed{\int \frac{1}{x}\,dx = \int x^{-1}\,dx = \ln|x| + C}$

$\boxed{\int k\,dx = kx + C}$

$\boxed{\int f \pm g\,dx = \int f\,dx \pm \int g\,dx}$

$\boxed{\int k\,f(x)\,dx = k\int f(x)\,dx}$

$\boxed{\int \cos(ax)\,dx = \frac{1}{a}\sin(ax) + C}$

$\frac{d}{dx}(\sin(ax)) = a\cos(ax)$

c) $\int t^{3/2} - e^{2t} + \sin(4t)\,dt$

$$\int \sin(ax)\,dx = -\frac{1}{a}\cos(ax) + C$$

$$= \frac{t^{3/2+1}}{3/2+1} - \frac{1}{2}e^{2t} - \frac{1}{4}\cos(4t) + C$$

$$= \boxed{\frac{2}{5}t^{5/2} - \frac{1}{2}e^{2t} - \frac{1}{4}\cos(4t) + C}$$

d) $\int \sin(\tfrac{3}{2}q) + \cos(\pi q)\,dq$

$$= -\frac{1}{3/2}\cos(\tfrac{3}{2}q) + \frac{1}{\pi}\sin(\pi q) + C = \boxed{-\frac{2}{3}\cos(\tfrac{3}{2}q) + \tfrac{1}{\pi}\sin(\pi q) + C}$$

$$\int \sin 2x\,dx = -\frac{1}{2}\boxed{\cos(2x)} + C$$

$$\frac{d}{dx}\left(-\frac{1}{2}\cos(2x)\right) = \frac{+1}{\cancel{2}}\left(+\sin(2x)\right)\cdot\cancel{2} = \sin 2x$$

e) $\int \frac{2}{x} + \frac{x}{x^{1/3}} + \cos(-x)\,dx$

$\frac{x^1}{x^{1/3}} = x^{1-1/3}$

$= \int 2x^{-1} + x^{\underbrace{1-1/3}_{=2/3}} + \cos(-x)\,dx$

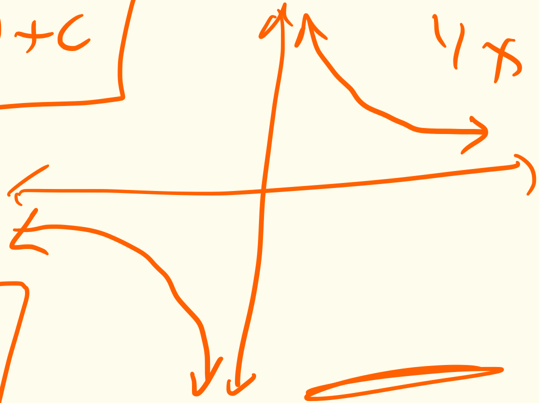
$= 2\ln|x| + \frac{x^{2/3+1}}{2/3+1} + \frac{1}{-1}\sin(-x) + C$

$\int x^{-1}\,dx = \ln|x| + C$

$= 2\ln|x| + \frac{3}{5}x^{5/3} - \sin(-x) + C$

$= \boxed{2\ln|x| + 3/5\, x^{5/3} - \sin(-x) + C}$

$\cos(-x) = \cos(-1 \cdot x)$



$\int \cos(ax)\,dx = \frac{1}{a}\sin(ax) + C$

F) $\int (x^2+1)(x^3-x)\,dx$

$$= \int x^5 - x^1\,dx = \frac{x^{5+1}}{5+1} - \frac{x^{1+1}}{1+1} + C$$

$$= \boxed{\frac{1}{6}x^6 - \frac{1}{2}x^2 + C}$$

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

$$= x^5 - x^3 + x^3 - x = x^5 - x$$

$$(\square + \triangle)\cdot \bigcirc = \square \cdot \bigcirc + \triangle \cdot \bigcirc$$