Mid Chapter Quiz (Odds)

1) $\int 3dx = 3x + C$

$\frac{d}{dx}[3x+C] = 3$

3) $\int \frac{1}{x^5} dx = \int x^{-5} dx$

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

$= -\frac{x^{-4}}{4} + C$

$= \frac{-1}{4x^4} + C$

$\frac{d}{dx}\left[-\frac{x^{-4}}{4} + C\right] = -\frac{(-4)x^{-5}}{4} + 0$

$= x^{-5}$

$= \frac{1}{x^5}$

5) $\int x(x+4)dx = \int x^2 + 4x\, dx$

$= \frac{x^3}{3} + \frac{4x^2}{2} + C$

$= \frac{x^3}{3} + 2x^2 + C$

$\frac{d}{dx}\left[\frac{x^3}{3} + 2x^2 + C\right] = \frac{3x^2}{3} + 4x + 0$

$= x^2 + 4x$

$= x(x+4)$

7) $\int (x^2-5x)(2x-5)\, dx$ let $u = x^2 - 5x$, $du = (2x-5)\, dx$

$= \int u\, du$

$= \frac{u^2}{2} + C$

$= \frac{(x^2-5x)^2}{2} + C$

$\frac{d}{dx}\left[\frac{(x^2-5x)^2}{2} + C\right] = \frac{1}{2}\left[2(x^2-5x)(2x-5)\right] + 0$

$= (x^2-5x)(2x-5)$

9) $\int \sqrt{5x+2}\, dx = \int (5x+2)^{1/2} dx$

let $u = 5x+2$

$du = 5dx \rightarrow \frac{1}{5} du = dx$

$= \int u^{1/2} \left(\frac{1}{5}\right) du$

$= \frac{1}{5} \int u^{1/2} du$

$= \frac{1}{5}\left(\frac{u^{1/2+1}}{1/2+1}\right) + C$

$= \frac{1}{5}\left(\frac{u^{3/2}}{3/2}\right) + C$

$= \frac{2}{15} u^{3/2} + C$

$= \frac{2}{15}(5x+2)^{3/2} + C$

11) $f'(x) = 9x^2 + 4, \quad f(1) = 5$

$f(x) = \int f'(x)\,dx$

$= \int 9x^2 + 4\,dx$

$= 9\left(\frac{x^3}{3}\right) + 4x + C$

$= 3x^3 + 4x + C$

$f(1) = 5 = 3(1)^3 + 4(1) + C$

$5 = 3 + 4 + C$

$-2 = C$

$y = 3x^3 + 4x - 2$

13) $\int 5e^{5x+4}\,dx$ let $u = 5x+4$

$\frac{du}{dx} = 5$

$du = 5\,dx$

$= \int e^u\,du$

$= e^u + C$

$= e^{5x+4} + C$

$\frac{d}{dx}\left[e^{5x+4} + C\right] = e^{5x+4}\frac{d}{dx}[5x+4] + 0$

$= e^{5x+4}(5)$

$= 5e^{5x+4}$

15) $\int 3x^2 e^{x^3}\,dx$ let $u = x^3$

$\frac{du}{dx} = 3x^2$

$du = 3x^2\,dx$

$= \int e^u\,du$

$= e^u + C$

$= e^{x^3} + C$

$\frac{d}{dx}\left[e^{x^3} + C\right] = e^{x^3}\frac{d}{dx}\left[x^3\right] + 0$

$= e^{x^3}(3x^2)$

$= 3x^2 e^{x^3}$

17) $\int \frac{-2x}{x^2+3}\,dx$ let $u = x^2 + 3$

$du = 2x\,dx$

$= -\int \frac{2x}{x^2+3}\,dx$

$= -\int \frac{1}{u}\,du$

$= -\ln|u| + C$

$= -\ln|x^2+3| + C$

19) (Partial soln)

a) $\int 3\sqrt{t+2}\,dt = 3\int (t+2)^{1/2}\,dt = 3\int u^{1/2}\,du = \frac{3u^{3/2}}{3/2} + C$

let $u = t+2$, $du = dt$

$= 2(t+2)^{3/2} + C$