Practice Integrals – Math 307

1. $\displaystyle\int x\sin(3x)\,dx$

2. $\displaystyle\int x^2 e^{-2x}\,dx$

3. $\displaystyle\int \sin x\cos x\,dx$

4. $\displaystyle\int \cos^2 x\,dx$

5. $\displaystyle\int \frac{1}{x\cdot(\ln x)^2}\,dx$

6. $\displaystyle\int e^{(3-\cos x)}\sin x\,dx$

7. $\displaystyle\int e^{-st}\cos 5t\,dt \quad (s \text{ is a constant})$

Answers:

1. $-\dfrac{1}{3}x\cos(3x) + \dfrac{1}{9}\sin(3x) + a.$

2. $-\dfrac{1}{2}x^2 e^{-2x} - \dfrac{1}{2}xe^{-2x} - \dfrac{1}{4}e^{-2x} + b.$

3. $-\dfrac{1}{4}\cos(2x) + d.$ Other correct answers are $\dfrac{1}{2}\sin^2(x) + d$ or $-\dfrac{1}{2}\cos^2(x) + d.$
   (Question to think about: why are these answers all correct?)

4. $\dfrac{x}{2} + \dfrac{\sin 2x}{4} + c.$

5. $-\dfrac{1}{\ln x} + f.$

6. $e^{(3-\cos x)} + g.$

7. $e^{-st}\dfrac{-s\cos(5t) + 5\sin(5t)}{s^2 + 25} + h.$