1. $\int_1^{e^3} \ln(2x)\,dx$ *Hint:* Parts: $u = \ln(2x),\ dv = dx$
Answer: $e^3\ln(2e^3) - e^3 - \ln(2) + 1$

2. $\int \frac{e^x}{1+e^{2x}}\,dx$ *Hint:* u-sub: $u = e^x$
Answer: $\arctan(e^x) + C$

3. $\int \cos(x)\sin(x)e^{\sin(x)}\,dx$ *Hint:* Parts: $u = \sin(x),\ dv = \cos(x)e^{\sin(x)}dx$
Answer: $\sin(x)e^{\sin(x)} - e^{\sin(x)} + C$

4. $\int x^3\cos(x^4)\,dx$ *Hint:* u-sub: $u = x^4$
Answer: $\frac{1}{4}\sin(x^4) + C$

5. $\int x^3\sin(x^2)\,dx$ *Hint:* Parts: $u = x^2,\ dv = x\sin(x^2)dx$
Answer: $-\frac{1}{2}x^2\cos(x^2) + \frac{1}{2}\sin(x^2) + C$

6. $\int \arctan(x)\,dx$ *Hint:* Parts: $u = \arctan(x),\ dv = dx$
Answer: $x\arctan(x) - \frac{1}{2}\ln(1+x^2) + C$

7. $\int_2^3 \frac{x^2-1}{x^3-3x}\,dx$ *Hint:* u-sub: $u = x^3 - 3x$
Answer: $\frac{1}{3}\ln(18) - \frac{1}{3}\ln(2) = \ln(\sqrt[3]{9}) = \frac{2}{3}\ln(3)$

8. $\int_0^{\pi} e^x\sin(e^x)\,dx$ *Hint:* u-sub: $u = e^x$
Answer: $-\cos(e^{\pi}) + \cos(1)$

9. $\int_1^5 x\sqrt{28-x^2}\,dx$ *Hint:* u-sub: $u = 28 - x^2$
Answer: $-\frac{1}{3}\left(3^{\frac{3}{2}} - 27^{\frac{3}{2}}\right) = 26\sqrt{3}$

10. $\displaystyle\int \frac{e^x}{1+e^x}\,dx$ *Hint:* u-sub: $u = 1 + e^x$
Answer: $\ln(1+e^x) + C$

11. $\displaystyle\int x^5 e^{x^3}\,dx$ *Hint:* Parts: $u = x^3,\ dv = x^2 e^{x^3} dx$
Answer: $\dfrac{1}{3}x^3 e^{x^3} - \frac{1}{3}e^{x^3} + C$

12. $\displaystyle\int \frac{3}{x^2+6x+10}\,dx$ *Hint:* Complete the square: $\displaystyle\int \frac{3}{(x+3)^2+1}\,dx$, then u-sub: $u = x+3$
Answer: $3\arctan(x+3) + C$

13. $\displaystyle\int \frac{x}{x+1}\,dx$ *Hint:* u-sub: $u = x+1$
Answer: $x + 1 - \ln(x+1) + C = x - \ln(x+1) + C$

14. $\displaystyle\int \frac{\sec(x)^2}{\sqrt{1-\tan(x)^2}}\,dx$ *Hint:* u-sub: $\tan(x)$
Answer: $\arcsin(\tan(x)) + C$

15. $\displaystyle\int \sin(x)^2\,dx$ *Hint:* Parts: $u = \sin(x),\ dv = \sin(x)dx$ and the trig identity $\sin(x)^2 + \cos(x)^2 = 1$
Answer: $\dfrac{1}{2}\left(x - \sin(x)\cos(x)\right) + C$

16. $\displaystyle\int_0^{\pi} e^x \sin(x)\,dx$
Hint: Parts twice
Answer: $\dfrac{1}{2}\left[-e^x\cos(x) + e^x\sin(x)\right]_0^{\pi} = \dfrac{e^{\pi}+1}{2}$