11. $\int_0^1 (1+\sqrt{x})^8\,dx = \int_1^2 u^8\, 2(u-1)\,du$

$u = 1+\sqrt{x}$
$x = (u-1)^2$
$dx = 2(u-1)\,du$

$= \int_1^2 2u^9 - 2u^8\,du$

$= \frac{1}{5}u^{10} - \frac{2}{9}u^9 \Big|_1^2$

$= \frac{1024}{5} - \frac{1024}{9} - \frac{1}{5} + \frac{2}{9}$

$= \frac{4096}{45} + \frac{1}{45} = \frac{4097}{45}$

16. $\int \frac{x}{x^2+3x+2}\,dx = \int \frac{x}{(x+2)(x+1)}\,dx$

$= \int \frac{2}{x+2} - \frac{1}{x+1}\,dx$

$= 2\ln|x+2| - \ln|x+1| + C$

17. $\int x^2\cosh x\,dx = x^2\sinh x - 2x\cosh x + 2\sinh x + C$

Parts:

D	I
x^2	$\cosh x$
$2x$	$\sinh x$
2	$\cosh x$
0	$\sinh x$

12. $\int_0^{\pi/4} \tan^3 x \sec^4 x\,dx = \int_0^{\pi/4} \tan^3 x\,(\tan^2 x + 1)\sec^2 x\,dx$

$u = \tan x$
$du = \sec^2 x\,dx$

$= \int_0^1 u^3(u^2+1)\,du$

$= \int_0^1 u^5 + u^3\,du = \frac{1}{6}u^6 + \frac{1}{4}u^4 \Big|_0^1$

$= \frac{1}{6} + \frac{1}{4} = \frac{10}{24} = \frac{5}{12}$

18. $\int \frac{x^3+x+1}{x^4+2x^2+4x}\,dx = \frac{1}{4}\int \frac{du}{u}$

$u = x^4+2x^2+4x$
$du = 4x^3+4x+4$

$= \frac{1}{4}\ln|u| + C$
$= \frac{1}{4}\ln|x^4+2x^2+4x| + C$

13. $\int \frac{x}{x^2-2x+2}\,dx = \int \frac{x-1}{x^2-2x+2}\,dx + \int \frac{1}{x^2-2x+2}\,dx$

$u = x^2-2x+2$

$= \frac{1}{2}\int \frac{du}{u} + \int \frac{1}{(x-1)^2+1}\,dx$

$x-1 = \tan\theta$

$= \frac{1}{2}\ln|u| + \arctan(x-1) + C$

$= \frac{1}{2}\ln(x^2-2x+2) + \arctan(x-1) + C$

19. $\int \frac{\cos x}{1+\sin^2 x}\,dx = \int \frac{du}{1+u^2}$

$u = \sin x$
$du = \cos x\,dx$

$= \arctan u + C$
$= \arctan(\sin x) + C$

20. $\int \cos\sqrt{x}\,dx = \int (\cos u)\,2u\,du$

$u = \sqrt{x}$, $x = u^2$
$dx = 2u\,du$

Parts:

D	I
$2u$	$\cos u$
2	$\sin u$
0	$-\cos u$

$= 2u\sin u + 2\cos u + C$

$= 2\sqrt{x}\sin\sqrt{x} + 2\cos\sqrt{x} + C$

14. $\int x\sin^{-1}x\,dx = \int x\arcsin x\,dx$

Parts: $u = \arcsin x$, $dv = x\,dx$
$du = \frac{dx}{\sqrt{1-x^2}}$, $v = \frac{1}{2}x^2$

$= \frac{1}{2}x^2\arcsin x - \frac{1}{2}\int \frac{x^2}{\sqrt{1-x^2}}\,dx$

Subs: $x = \sin\theta$ or $\cos\theta$
$dx = \cos\theta\,d\theta$

$= \frac{1}{2}x^2\arcsin x - \frac{1}{2}\int \sin^2\theta\,d\theta$

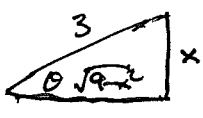
$= \frac{1}{2}x^2\arcsin x - \frac{1}{4}\int 1-\cos 2\theta\,d\theta$

$= \frac{1}{2}x^2\arcsin x - \frac{1}{4}\theta + \frac{1}{8}\sin 2\theta + C$

$= \frac{1}{2}x^2\arcsin x - \frac{1}{4}\arcsin x + \frac{1}{4}x\sqrt{1-x^2} + C$

15. $\int \frac{\sqrt{9-x^2}}{x}\,dx = \int \frac{3\cos\theta \cdot 3\cos\theta\,d\theta}{3\sin\theta} = 3\int \frac{1-\sin^2\theta}{\sin\theta}\,d\theta = 3\int \csc\theta - \sin\theta\,d\theta = 3(-\ln(\csc\theta+\cot\theta) + \cos\theta) + C$

$x = 3\sin\theta$
$dx = 3\cos\theta\,d\theta$
$\sin\theta = \frac{x}{3}$



$= 3\left(-\ln\left|\frac{3}{x} + \frac{\sqrt{9-x^2}}{x}\right| + \frac{\sqrt{9-x^2}}{3}\right) + C$

$= \sqrt{9-x^2} - 3\ln\left|\frac{3+\sqrt{9-x^2}}{x}\right| + C$