The Cauchy Residue Theoerm- HW Problems

In problems 1-10 use the Cauchy residue theorem to evaluate the integrals where C is the circle given by $|z| = 2$.

1. $\oint_C \frac{\cos(\pi z)}{z^2-1} dz$

2. $\oint_C \frac{z}{z^2+3z-4} dz$

3. $\oint_C (z^3 e^{\frac{1}{z}}) dz$

4. $\oint_C \frac{z-1}{z(2z+1)(z+3)} dz$

5. $\oint_C \frac{3e^z}{z(z+1)^2} dz$

6. $\oint_C \frac{1}{z^3 \cos(z)} dz$

7. $\oint_C (z^4 \sin\left(\frac{1}{z}\right)) dz$

8. $\oint_C \frac{1}{1+e^z} dz$

9. $\oint_C \frac{e^{\pi z}}{z^2(z^2+1)} dz$

10. $\displaystyle\oint_C \frac{e^{\cosh(2z)}}{4z^2+\pi^2}\,dz$