Question 1 Choose the best integration technique for each integral.

Integral	$u-$ substitution $u=\ldots, du=\ldots$	integration by parts $u=\ldots, v'=\ldots$	trigonometric substitution $x=\ldots, dx=\ldots$	integration by fractional parts general terms
$\int x\ln(x)\ dx$		$u=\ln(x), v'=x$		
$\int \frac{1}{x^2-7x+10}\ dx$				$A/(x-2)+B/(x-5)$
$\int \frac{1}{4-x^2}\ dx$			$x=2\sin\theta, dx=2\cos\theta\ d\theta$	$A/(x-2)+B/(x+2)$
$\int \frac{1}{(9x^2-1)^{5/2}}\ dx$			$x=1/3\sec\theta, dx=1/3\sec\theta\tan\theta\ d\theta$	
$\int 5xe^{x^2}\ dx$	$u=x^2, du=2x\ dx$			
$\int \frac{1}{x(x+1)}\ dx$				$A/x+B/(x+1)$
$\int \frac{3x+2}{x^2-2x+1}\ dx$				$A/(x-1)+B/(x-1)^2$
$\int 3x\sin(x^2)\ dx$	$u=x^2, du=2x\ dx$			
$\int x\cos(x)\ dx$		$u=x, v'=\cos x$		
$\int x^2e^x\ dx$		$u=x^2, v'=e^x$		
$\int \frac{e^{\sqrt{x}}}{2\sqrt{x}}\ dx$	$u=\sqrt{x}, du=dx/2\sqrt{x}$			
$\int \frac{2x}{4+x^2}\ dx$	$u=4+x^2, du=2x\ dx$			

Question 2 Choose the best convergence test for each infinite series.

Don't forget to state whether the series converges or diverges!

Series	C/D	divergence test $a_n \not\to 0$	alt. series test $b_n > 0, \to 0$	integral test technique	comparison test $a_n <> b_n$	limit comparison $\lvert\frac{a_n}{b_n}\rvert \to \dots$	ratio test $\lvert\frac{a_{n+1}}{a_n}\rvert \to \dots$	root test $\sqrt[n]{\lvert a_n\rvert} \to \dots$
$\sum \frac{2^n}{4^n+6^{-n}}$	C				$\frac{2^n}{4^n+6^{-n}} < (\frac{1}{2})^n$			
$\sum(-1)^n \frac{n}{n+2}$	D	$(-1)^n \frac{n}{n+2} \not\to 0$						
$\sum(-1)^n \frac{\ln(n)}{n^2}$	C		$\frac{\ln(n)}{n^2} \to 0$					
$\sum(\frac{n}{3n+1})^n$	C							$(\frac{n}{3n+1})^{\frac{n}{n}} \to \frac{1}{3}$
$\sum ne^{-n^2}$	C			$u-sub$				
$\sum \frac{2n}{3n^4+4n^2}$	C				$\frac{2n}{3n^4+4n^2} < \frac{2}{3n^3}$			
$\sum(-1)^n \cos(\pi n)$	D	$(-1)^n \cos(\pi n) \not\to 0$						
$\sum(-1)^n \frac{5^n}{n!}$	C		$\frac{5^n}{n!} \to 0$					
$\sum \frac{1}{n\ln(n)}$	D			$u-sub$				
$\sum(-1)^n \frac{1}{n\ln(n)}$	C		$\frac{1}{n\ln(n)} \to 0$					
$\sum(\frac{1}{2}+\frac{1}{n})^{-n}$	D	$(\frac{1}{2}+\frac{1}{n})^{-n} \not\to 0$						$(\frac{1}{2}+\frac{1}{n})^{-\frac{n}{n}} \to 2$
$\sum \frac{1}{(2n)!}$	C						$\frac{(2n)!}{(2(n+1))!} \to 0$	
$\sum \frac{1}{\sqrt{n^3-3}}$	C					$\frac{n^{3/2}}{\sqrt{n^3-3}} \to 1$		