

Unless specified otherwise, please leave 15 mins for a quiz.
 Homeworks are due by 11:30 am on the date indicated, at my office (SA 130).
 Please drop your paper to the correct box!

Quiz 8

- (1) Evaluate: $1 - \frac{\pi^2}{4^2 \cdot 2!} + \frac{\pi^4}{4^4 \cdot 4!} + \dots + \frac{(-1)^k \pi^{2k}}{4^{2k} \cdot (2k)!} + \dots$
 (2) Multiply the Maclaurin series for e^x and $\cos x$ together to find the first five nonzero terms of the Maclaurin series for $e^x \cos x$.

Quiz 7

Evaluate: (1) $\lim_{n \rightarrow \infty} \left(\frac{n}{n-1} \right)^n$; (2) $\lim_{n \rightarrow \infty} \sqrt[n]{n^2 + n}$.

Quiz 6

- (1) Evaluate $\int_0^2 \frac{dx}{\sqrt{|x-1|}}$.
 (2) Test for convergence:

(a) $\int_{-\infty}^{\infty} \frac{dx}{\sqrt{x^4 + 1}}$, (b) $\int_{-\infty}^{\infty} \frac{e^{-x} dx}{x^2 + 1}$.

Quiz 5

Evaluate $\int \sqrt{x^2 + 2x - 1} dx$ for $x \geq \sqrt{2} - 1$.

Quiz 4

(20 mins) Evaluate $\int \frac{x^4 + x^3 + 4x^2 + 3x + 3}{(x+1)(x^2+1)^2} dx$.

For the graders: the partial fraction decomposition is $\frac{1}{x+1} + \frac{1}{x^2+1} + \frac{x+1}{(x^2+1)^2}$,
 the result being $\ln|x+1| + \frac{3}{2} \arctan x + \frac{2x-2}{4(x^2+1)} + C$.

Quiz 3

- (1) Differentiate $y = \ln x + \sqrt{1-x^2} \operatorname{sech}^{-1} x$.
 (2) Evaluate $\int_1^e \frac{dx}{x\sqrt{1+(\ln x)^2}}$.

Quiz 2

- (1) Evaluate $\int \frac{dx}{x(\log_8 x)^2}$.
 (2) Differentiate: $y = (\ln x)^{\ln x}$.
 (3) Which of the functions below grow faster/slower than x^2 when $x \rightarrow \infty$:

$x^5 - x^2$, $2x^2 - x$, $(x+3)^2$, 2^x , $\log_2 x$?

Quiz 1

- (1) Evaluate $\int_2^{16} \frac{dx}{2x\sqrt{\ln x}}$.
- (2) Differentiate $\sqrt[3]{\frac{x(x+1)(x-2)}{(x^2+1)(2x+3)}}$.

Homework 6 (due 25/12)

Page 832, #28: Find series solution for the initial value problem: $y'' - y = x$, $y(0) = -1$, $y'(0) = 2$.

Page 832, #36: Evaluate $\int \sqrt[3]{1+x^2} dx$.

Page 832, #44: Find a polynomial that would approximate $F(x) = \int_0^x t^2 e^{-t^2} dt$ with an error of magnitude less than 10^{-3} .

Page 841, #84: Use the series to evaluate the limit: $\lim_{h \rightarrow 0} \frac{\sin h/h - \cos h}{h^2}$.

Page 844, #22: Show that if $\sum_{n=1}^{\infty} a_n$ converges, then so does $\sum_{n=1}^{\infty} \left(\frac{1 + \sin a_n}{2}\right)^n$.

Page 844, #26: Find the values of a and b for which $\lim_{x \rightarrow 0} \frac{\cos(ax) - b}{2x^2} = -1$.

Homework 5 (due 18/12)

Page 811, #24: Find the Taylor series generated by $f(x) = 3x^5 - x^4 + 2x^3 + x^2 - 2$ at $a = -1$.

Page 811, #26: Find the Taylor series generated by $f(x) = x/(1-x)$ at $a = 0$.

Page 820, #30a: Use the Taylor series for $\cos x$ and the alternating series estimation theorem to show that

$$\frac{1}{2} - \frac{x^2}{24} < \frac{1 - \cos x}{x^2} < \frac{1}{2}, \quad x \neq 0.$$

Page 820, #34: Identify as the Maclaurin series of a certain function $f(x)$ at some point $x = x_0$:

$$\pi - \frac{\pi^2}{2} + \frac{\pi^3}{3} + \dots + \frac{(-1)^{k-1} \pi^k}{k} + \dots$$

What is the sum of the series?

Page 820, #37: Use the identity $\sin^2 x = (1 - \cos 2x)/2$ to obtain the Maclaurin series for $\sin^2 x$. Differentiate to obtain the series for $2 \sin x \cos x$; compare the result to the series for $\sin 2x$.

Page 820, #38: (Continuation of #37.) Use the identity $\cos^2 x = \cos 2x + \sin^2 x$ to obtain a power series for $\cos^2 x$.

Homework 4 (due 20/11)

Page 757, #42: find the limit $\lim_{n \rightarrow \infty} \frac{\sin^2 n}{2^n}$.

Page 757, #46: find the limit $\lim_{n \rightarrow \infty} \frac{\ln n}{\ln 2n}$.

Page 758, #68: find the limit $\lim_{n \rightarrow \infty} \left(1 - \frac{1}{n^2}\right)^n$.

Page 770, #36: test for convergence (give reasons for your answer) and, if the series converges, find its sum: $\sum_{n=1}^{\infty} \frac{n^n}{n!}$.

Page 775, #22: test for convergence (explain your answer) $\sum_{n=1}^{\infty} \frac{1}{n(1 + \ln^2 n)}$.

Page 781, #26: test for convergence (explain your answer) $\sum_{n=1}^{\infty} \tan \frac{1}{n}$.

Page 781, #36: test for convergence (and explain) $\sum_{n=1}^{\infty} \frac{1}{1^2 + 2^2 + \dots + n^2}$.

Homework 3 (due 13/11)

Page 631, #16: evaluate $\int_0^2 \frac{s+1}{\sqrt{4-s^2}} ds$.

Page 631, #34: evaluate $\int_0^{\infty} \frac{dx}{(x+1)(x^2+1)}$.

Page 631, #42: test for convergence $\int_0^1 \frac{dt}{t - \sin t}$. (*Hint: $t \geq \sin t$ for $t \geq 0$.*)

Page 631, #65: find the values of p for which each integral converges:

$$(a) \int_1^2 \frac{dx}{x(\ln x)^p}, \quad (b) \int_2^{\infty} \frac{dx}{x(\ln x)^p}.$$

Page 632, #69: Let R be the region in the first quadrant between the curve $y = e^{-x}$ and the x -axis. Find the volume of the solid generated by revolving R about the y -axis.

Page 638, #9: evaluate $\int \frac{dx}{x^4 + 4}$.

Homework 2 (due 7/11)

Page 568, #24: evaluate $\int e^{-2x} \sin 2x dx$.

Page 570, #44: evaluate $\int \tan^{-1} x dx$; if in trouble, see p. 570 of the textbook.

Page 579, #34: evaluate $\int \frac{2y^4 dy}{y^3 - y^2 + y - 1}$.

Page 586, #10: evaluate $\int_0^{\pi} 8 \sin^4 y \cos^2 y dy$.

Page 591, #14: evaluate $\int \frac{2dx}{x^3 \sqrt{x^2 - 1}}$, $x > 1$.

Page 592, #48: evaluate $\int_{\pi/2}^{2\pi/3} \frac{\cos \theta d\theta}{\sin \theta \cos \theta + \sin \theta}$.

Homework 1 (due 16/10)

Page 493, #54: evaluate $\int \frac{e^{-1/x^2}}{x^3} dx$.

Page 531, #62: find the derivative of $y = \tan^{-1}(\ln x)$ with respect to x .

Page 532, #100: evaluate $\int \frac{dy}{y^2 + 6y + 10}$.

Page 532, #112: evaluate $\int_{2/\sqrt{3}}^2 \frac{\cos(\sec^{-1} x) dx}{x\sqrt{x^2 - 1}}$.

Page 543, #30: find the derivative of $y = (1 - t^2) \coth^{-1} t$ with respect to t .

Page 544, #70: evaluate $\int_0^{1/2} \frac{dx}{1 - x^2}$ in terms of inverse hyperbolic functions and in terms of natural logarithms.