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: $1 - \frac{\pi^2}{4^2 \cdot 2!} + \frac{\pi^4}{4^4 \cdot 4!} + \ldots + \frac{(-1)^k \pi^{2k}}{4^{2k} \cdot (2k)!} + \ldots$.

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

Quiz 6

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

(2) Test for convergence:

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

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 $y = \ln x + \sqrt{1-x^2}\,\text{sech}^{-1} x$.

(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 $x \to \infty$:

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

Quiz 1

(1) Evaluate $\displaystyle\int_2^{16} \frac{dx}{2x\sqrt{\ln x}}$.

(2) Differentiate $\displaystyle\sqrt[3]{\frac{x(x+1)(x-2)}{(x^2+1)(2x+3)}}$.

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 $\displaystyle\int \sqrt[3]{1+x^2}\,dx$.

Page 832, #44: Find a polynomial that would approximate $F(x) = \displaystyle\int_0^x t^2 e^{-t^2}\,dt$ with an error of magnitude less that 10^{-3}.
Page 841, #84: Use the series to evaluate the limit: $\displaystyle\lim_{h\to 0} \frac{\sin h/h - \cos h}{h^2}$.
Page 844, #22: Show that if $\sum_{n=1}^{\infty} a_n$ converges, then so does $\displaystyle\sum_{n=1}^{\infty} \Big(\frac{1+\sin a_n}{2}\Big)^n$.
Page 844, #26: Find the values of a and b for which $\displaystyle\lim_{x\to 0} \frac{\cos(ax) - b}{2x^2} = -1$.

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 $x = x_0$:

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

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 $\displaystyle\lim_{n\to\infty} \frac{\sin^2 n}{2^n}$.

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

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

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

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

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

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

Homework 3 (due 13/11)

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

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

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

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

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

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 $\int \dfrac{dx}{x^4+4}$.

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 $\int \dfrac{2y^4\, dy}{y^3 - y^2 + y - 1}$.

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

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

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

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.