Mathematics 1220 PRACTICE EXAM II Spring 2017

1. Calculate the following limits. Be sure to show all of your work.

   (a) $\lim_{n\to\infty} n\,(\sqrt[n]{n}-1)$ (b) $\lim_{x\to 0}(\cos x)^{\csc x}$ (c) $\lim_{x\to+\infty} x^{25}e^{-x}$ (d) $\lim_{x\to\infty}\dfrac{xe^{-x^2/2}}{e^{-x}}$

   (e) $\lim_{x\to-\infty}(e^{-x}-x)$ (f) $\lim_{x\to 1^+}\dfrac{\int_1^x \sin t\ dt}{x-1}$ (g) $\lim_{x\to 0}\dfrac{\int_0^x (e^{t^2}-1)\ dt}{x^3}$

   (h) $\lim_{x\to\infty}\dfrac{3x}{\ln(100x+e^x)}$ (i) $\lim_{x\to 0}\dfrac{\cos x-1}{x^2}$

2. Calculate the following integrals. Be sure to show all of your work.

   (a) $\int_{-\pi}^{\pi}\sin mx\cos nx\ dx$ (b) $\int_0^{2\pi}\sin mx\sin nx\ dx\ ,\ \ m=n$

   (c) $\int \tanh x\ln(\cosh x)\ dx$ (d) $\int\dfrac{e^x dx}{e^{2x}+2e^x+5}$ (e) $\int\dfrac{3x-1}{x^2-4}\ dx$

   (f) $\int\cos(\ln x)\ dx$ (g) $\int\dfrac{x\ dx}{2x^3+6x^2}\ dx$ (h) $\int(t+1)e^{-t^2-2t-5}dt$

   (i) $\int\sin^3 x dx$ (j) $\int xe^x dx$ (k) $\int\dfrac{3x-13}{x^2+3x-10}dx$

3. Section 7.1 #9, 19, 34

4. Section 7.2 #17, 39, 41

5. Section 7.3 #5, 30

6. Determine whether the following improper integrals converge or diverge. Be sure to justify your answer completely.

   (a) $\int_e^{\infty}\dfrac{dx}{x\sqrt{\ln x}}$ (b) $\int_1^{\infty}\dfrac{\ln x}{\sqrt{x^3+2x+1}}\ dx$ (c) $\int_0^{\infty}e^{-x}\cos x\ dx$

   (d) $\int_{-\infty}^{\infty}\dfrac{e^{-x^2}}{x^2}\ dx$ (e) $\int_0^{\infty}x^{16{,}000}e^{-x}\ dx$ (f) $\int_0^1\dfrac{e^{-x}\sqrt{1+x}}{\sqrt[3]{\sin x\tan x}}\ dx$

7. Find the limits of the following sequences or prove they diverge. Be sure to justify your answer completely.

   (a) $\lim_{n\to\infty}(-1)^n\dfrac{n}{n+2}$ (b) $\lim_{n\to\infty}\dfrac{\sqrt{n^2+4}}{2n+1}$

   (c) $\lim_{n\to\infty}\dfrac{\cos(2n)}{n^{1/2}}$ (d) $\lim_{n\to\infty}\ln n-\ln(n+1)$