MATH 202 Quiz 7 – Version B

October 20, 2015

Name: ANSWERS

Instructions: No calculators! Use your own scrap paper and write your answers in the space provided.

1. Simplify or perform the long division:

   (a) $\frac{x^3-5}{x+1} = x^2 - x + 1 - \frac{6}{x+1}$ (b) $\frac{x^2+5x+1}{x^2+2} = 1 + \frac{5x-1}{x^2+2}$

2. Write down the partial fraction decomposition of the following. Do NOT solve for the arbitrary constants:

   (a) $\frac{2x^2-7}{x^3(x-2)(x^2+3)} = \frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{D}{x-2} + \frac{Ex+F}{x^2+3}$

   (b) $\frac{4-3x^2}{(x^2+4x+4)(x+3)} = \frac{A}{x+2} + \frac{B}{(x+2)^2} + \frac{C}{x+3}$

   (c) $\frac{7}{x^6-x^3} = \frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{D}{x-1} + \frac{Ex+F}{x^2+x+1}$

   $x^3(x^3-1)$

3. Complete the following table of trig substitutions:

Expression	Substitution	Identity
$\sqrt{a^2-x^2}$	$x = a\sin\theta$ or $x = a\cos\theta$	$1-\sin^2\theta = \cos^2\theta$ or $1-\cos^2\theta = \sin^2\theta$
$\sqrt{x^2+a^2}$	$x = a\tan\theta$	$\tan^2\theta + 1 = \sec^2\theta$
$\sqrt{x^2-a^2}$	$x = a\sec\theta$	$\sec^2\theta - 1 = \tan^2\theta$

4. Integrate the following:

(a) $\int \frac{x^2-7x+1}{x^2+1}\,dx = x - \frac{7}{2}\ln|x^2+1| + C$ (b) $\int \frac{x^3}{\sqrt{5+x^2}}\,dx = \frac{(5+x^2)^{3/2}}{3} - 5\sqrt{5+x^2} + C$

(c) $\int \sqrt{1+\cos 2x}\,dx = \sqrt{2}\sin x + C$ (d) $\int \frac{1}{x^2-x}\,dx = \ln|x-1| - \ln|x| + C$

(e) $\int \frac{x^3}{x-1}\,dx = \frac{x^3}{3} + \frac{x^2}{2} + x + \ln|x-1| + C$ (f) $\int \sqrt{5-9x^2}\,dx = \frac{5}{6}\left(\sin^{-1}\left(\frac{3x}{\sqrt{5}}\right) + \frac{3x\sqrt{5-9x^2}}{5}\right) + C$

Bonus:

1. (a) $\int \frac{\sqrt{x}}{x-9}\,dx = 2\sqrt{x} + 3\ln|\sqrt{x}-3| - 3\ln|\sqrt{x}+3| + C$ (b) $\int \frac{\sin x}{\cos^2 x - 2\cos x}\,dx = \frac{1}{2}\left(\ln|\cos x| - \ln|\cos x - 2|\right) + C$

2. In approximating the integral $\int_a^b f(x)\,dx$ with n subintervals, define what Δx is.

$\Delta x = \frac{b-a}{n}$