MATE 3032 assignment 4: sections 7.3, 7.4, 7.5

Homework 3 had a preamble stated in plain English: in problems involving trigonometric substitution, you must show not only the correspondence (say, x some function of θ), **but also indicate the interval for** θ. I specifically asked you to do this using one or two arcs of circle, as I showed in class. When replacing, say, $\sqrt{\tan^2\theta}$ by $\tan\theta$, I have added: "*since* $\tan\theta \geq 0$ *on this interval*". Use the figures I have shown and, for your solution to be credible, write the same words as above. **Redo problems 22(b) and 23, following these instructions.** Number the problems the same way as before: 22, 23.

26. Evaluate the integral:

(a) $\displaystyle\int_0^1 \frac{x^2 - x + 1}{(x+1)(x+2)^2}\,dx$

(b) $\displaystyle\int_0^1 \frac{x^3}{x^4 + 4x^2 + 3}\,dx$

(c) $\displaystyle\int_0^1 \frac{x+1}{x^2 - 5x + 6}\,dx$

(d) $\displaystyle\int \frac{1}{x^3 - 1}\,dx$

27. Make a substitution to express the integrand as a rational function, then evaluate the integral:

(a) $\displaystyle\int_0^1 \frac{dx}{1 + 2e^x}$

(b) $\displaystyle\int \frac{x^3}{\sqrt[3]{1+x^2}}\,dx$. The correct substitution yields a polynomial.

(c) $\displaystyle\int \frac{\cosh t}{\sinh^2 t + \sinh^4 t}\,dt$. The hyperbolic functions cosh and sinh satisfy: $d(\cosh t) = \sinh t dt$, $d(\sinh t) = \cosh t\, dt$, $1 + \sinh^2 t = \cosh^2 t$.

28. Evaluate the integral:

(a) $\displaystyle\int_0^1 (2x+1)^{\sqrt{3}}\,dx$

(b) $\displaystyle\int \frac{\sin^3 x}{\cos x}\,dx$

(c) $\displaystyle\int_0^2 \frac{t}{t^4 + 2}\,dt$

(d) $\int \frac{\sin(1/t)}{t^3}\, dt$.

29. Evaluate:

(a) $\int_0^{\pi} t \sin^2 t \, dt$

(b) $\int \frac{\sec^2 t}{1 + \sec^2 t}\, dt$

(c) $\int \frac{dx}{x\sqrt{1 + x^2}}$ (hint: a direct substitution is easier than a trigonometric substitution).

(d) $\int \frac{x - 2}{x^3 + 2x}\, dx$.

30. Exercise 73 p.503. This is another way of validating how to obtain the coefficients in the partial fractions expansion: if a is a root of $Q(x)$ (so that $R(x) = P(x)/Q(x)$ is not defined at a), in the equation which we labelled (**), which consists of multiplying both $R(x)$ and its standard expansion by $Q(x)$, we can still let $x = a$, instead of letting $x \to a$.