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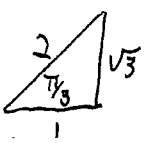
Quiz 4

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. *(5 marks)* §5.3 #25 Evaluate the integral.

$$\int_0^{\pi/3} \frac{\sin\theta + \sin\theta\tan^2\theta}{\sec^2\theta}\,d\theta = \int_0^{\pi/3} \frac{\sin\theta(1+\tan^2\theta)}{\sec^2\theta}\,d\theta$$



$$= \int_0^{\pi/3} \frac{\sin\theta\sec^2\theta}{\sec^2\theta}\,d\theta$$

$$= \int_0^{\pi/3} \sin\theta\,d\theta$$

$$= \left[-\cos\theta\right]_0^{\pi/3}$$

$$= -\cos\frac{\pi}{3} + \cos 0$$

$$= -\frac{1}{2} + 1$$

$$= \frac{1}{2}$$

Question 2. *(5 marks)* §5.4 #13 Use the Second Fundamental Theorem of Calculus to find the derivative of the function.

$$g(x) = \int_{2x}^{3x} \frac{u^2-1}{u^2+1}\,du$$

$$= \int_{2x}^{0} \frac{u^2-1}{u^2+1}\,du + \int_0^{3x} \frac{u^2-1}{u^2+1}\,du$$

$$= -\int_0^{2x} \frac{u^2-1}{u^2+1}\,du + \int_0^{3x} \frac{u^2-1}{u^2+1}\,du$$

$$= -f(h_1(x)) + f(h_2(x))$$

where $f(x) = \int_0^x \frac{u^2-1}{u^2+1}\,du$, $h_1(x) = 2x$, $h_2(x) = 3x$

and $f'(x) = \frac{x^2-1}{x^2+1}$ by 2nd FTC

$h_1'(x) = 2$, $h_2'(x) = 3$

So

$$g'(x) = -f'(h_1(x))h_1'(x) + f'(h_2(x))h_2'(x)$$

$$= -\left(\frac{(2x)^2-1}{(2x)^2+1}\right)2 + \left(\frac{(3x)^2-1}{(3x)^2+1}\right)\cdot 3$$