MAT126.R02: QUIZ 0

SOLUTIONS

If you could not even start on any of the derivatives in problem 4, you should seriously consider dropping this course.

1. $\ln(\cos\pi) = \ln(-1)$, does not exist.

2. Solve for x: $2^{x^2+2x} = 8$
$2^{x^2+2x} = 2^3$
$x^2 + 2x = 3$
$x^2 + 2x - 3 = 0$
$(x+3)(x-1) = 0$
$x = -3, 1$

3. (a) $\lim_{x\to 3} \frac{x^2-9}{x-3} = \lim_{x\to 3} \frac{(x-3)(x+3)}{x-3} = \lim_{x\to 3} x+3 = 3+3 = 6$

(b) $\lim_{x\to 0} \frac{x^2-9}{x-3} = \lim_{x\to 0} \frac{0^2-9}{0-3} = \frac{-9}{-3} = 3$

4. Differentiate the following functions:
(a) $(\ln\cos x)' = \frac{1}{\cos x}(-\sin x) = -\frac{\sin x}{\cos x} = -\tan x$
using the chain rule: $u = \cos x$, $(\ln u)' = 1/u$, $(\cos x)' = -\sin x$.

(b) $\left(\frac{e^t}{t}\right)' = \frac{(e^t)'t - e^t(t)'}{t^2} = \frac{e^t t - e^t}{t^2} = e^t\frac{t-1}{t^2}$
using the quotient rule

(c) $(\sqrt[3]{w+1} + \sqrt[3]{w-1})' = ((w+1)^{1/3} + (w-1)^{1/3})' = \frac{1}{3}(w+1)^{-2/3} + \frac{1}{3}(w-1)^{-2/3} = \frac{1}{3}\left(\frac{1}{\sqrt[3]{(w+1)^2}} + \frac{1}{\sqrt[3]{(w-1)^2}}\right)$

5. Compute $\int_{-\pi}^{\pi} x\cos x\, dx$

$x\cos x$ is an odd function ($f(-x) = -f(x)$), so $\int_{-\pi}^{0} x\cos x\, dx = -\int_{0}^{\pi} x\cos x\, dx$, as the values of the function over the two intervals of integration are the opposites of each other. Hence the intergral from $-\pi$ to π is zero.