Question 1 [10]: Determine the derivatives of the following functions. It is not necessary to simplify your final answers.

(a) $y = \ln(\sec x)$

[3]

(b) $f(x) = \sin^{-1}(e^x)$

[3]

(c) $y = 10^{\arctan(\pi x)}$

[4]

(d) $g(x) = \ln(e^{-x} + xe^{-x})$

[4]

Question 2 [10]:

(a) Solve for x: $\ln(x+1) + \ln(x-1) = 1$

[3]

(b) Find the exact value of $\tan(\arcsin(-1/2))$.

[3]

Question 3: Use logarithmic differentiation to find y' where $y = \dfrac{\sqrt{x+1}\,(x+5)^3}{(x+3)^5}$.

[4]

Question 4: Determine the following limits:

(a) $\lim_{x \to 0} \dfrac{\sin(5x)}{\tan(3x)}$

[3]

(b) $\lim_{x \to 0^+} \sqrt{x}\, \ln(x)$

[3]

(c) $\lim_{x \to 1^+} x^{1/(1-x)}$

[4]

Question 5: Determine the absolute minimum and maximum values of $f(x) = x^2e^{-x}$ on the interval $[-1, 3]$. (Note: it may be useful to know that e^2 is approximately 7, and that e^3 is approximately 20.)

[6]

Question 6: For this question use $f(x) = \dfrac{x}{x^2+1}$

(a) Determine the intervals on which f is increasing or decreasing

[8]

(b) Determine the local (or relative) maximum and minimum values of f.

[2]