Question 1: Let $f(x) = e^{(2\sqrt{x}+1)}$. Find a formula for $f^{-1}(x)$ (you may assume that the given function $f(x)$ is one-to-one.)

[5]

Question 2: Use logarithmic differentiation to find y'. Express your answer as a function of x only:

$$y = (\sin x)^{\ln x}$$

[5]

Question 3:

(a) Determine the exact value of $\cos^{-1}\left(\cos\left(5\pi/3\right)\right)$

[3]

(b) Find the derivative of $y = \arctan\left(\sqrt{\sin\left(\theta\right)}\right)$.

[3]

(c) Find an equation of the tangent line to $y = \sqrt{1 - x^2}\arccos\left(x\right)$ at the point where $x = 0$.

[4]

Question 4: Evaluate the following limits:

(a) $\displaystyle\lim_{x\to2}\frac{\ln(2x-3)}{x^2-4}$

[3]

(b) $\displaystyle\lim_{x\to0}\frac{2-x^2-2\cos(x)}{x^4}$

[3]

(c) $\displaystyle\lim_{x\to\infty}\left(e^x+1\right)^{1/x}$

[4]

Question 5: For this question use $f(x) = \frac{1}{2}x^2 - 6x + 8\ln(x)$

(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]

Question 6: For this question use $f(x) = x - \sin(x)$ on the interval $[0, 3\pi]$

(a) Determine the intervals of concavity.

[8]

(b) Determine all inflection points.

[2]