Question 1 [10 points]:

(a) Determine $\arcsin\left(-\sqrt{3}/2\right)$

[2]

(b) Determine $\sec\left(\cos^{-1}\left(1/2\right)\right)$.

[2]

(c) Let $f(x) = \arctan\left(\sqrt{x^2 - 1}\right)$. Calculate and simplify $f''(2)$.

[3]

(d) Express $\csc\left(\tan^{-1}\left(x\right)\right)$ in a simplified form that does not contain any trigonometric or inverse trigonometric functions.

[3]

Question 2 [10 points]:

(a)   Let $f(x) = 2\cosh(\ln(x))$. Find $f'(x)$ and simplify your answer so that is does not contain $\ln(x)$.

[3]

(b)   Determine $\lim\limits_{x \to \infty} (\cosh x - \sinh x)$.

[3]

(c)   Determine the x-coordinate of the point on the graph of $y = \cosh(x)$ at which the tangent line has slope 1.

[4]

Question 3 [10 points]: Find the following limits:

(a) $\lim\limits_{t \to 0} \dfrac{\tan(5t)}{2t}$

[2]

(b) $\lim\limits_{x \to 0} \dfrac{\sin(x) - x}{x^3}$

[3]

(c) $\lim\limits_{x \to 0^+} x(\ln(x))^2$

[5]

Question 4 [10 points]:

(a)   Determine the most general antiderivative of $f(x) = \dfrac{4}{x} - \dfrac{5}{\sqrt{1-x^2}}$.

[3]

(b)   Determine the most general antiderivative of $g(t) = \dfrac{t^3 + \sqrt{t} - 4}{t^3}$.

[3]

(c)   Determine $f(x)$ if $f''(x) = \pi \cos(x) - 2e^x$ and $f(0) = -\pi$, $f'(0) = 0$.

[4]

Question 5 [10 points]: Use the definition of the definite integral in the form

$$\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{i=1}^n f(x_i)\Delta x$$

to evaluate

$$\int_0^3 (x^2 - 3x)\,dx$$

Carefully set up the Riemann sum and clearly show the steps of your simplification.

[10]