

Question 1 [10 points]:

(a) Determine $\csc(\sin^{-1}(1/2))$.

[2]

(b) Determine $\arccos(-\sqrt{3}/2)$

[2]

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

[3]

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

[3]

Question 2 [10 points]:

(a) Determine $\lim_{x \rightarrow -\infty} (\sinh x + \cosh x)$.

[3]

(b) Let $f(x) = 2 \sinh(\ln(x))$. Find $f'(x)$ and simplify your answer so that it does not contain $\ln(x)$.

[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) $\lim_{t \rightarrow 0} \frac{\tan(2t)}{5t}$

[2]

(b) $\lim_{x \rightarrow 0} \frac{x - \sin(x)}{x^3}$

[3]

(c) $\lim_{x \rightarrow 0^+} x(\ln(x))^2$

[5]

Question 4 [10 points]:

(a) Determine the most general antiderivative of $g(t) = \frac{t^3 - \sqrt{t} + 7}{t^3}$.

[3]

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

[3]

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

[4]

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

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

to evaluate

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

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

[10]