

Question 1 [10 points]:

(a) Determine $\arccos(-1/\sqrt{2})$

[2]

(b) Determine $\sin^{-1}(\sin(4\pi/3))$.

[2]

(c) Determine $\lim_{x \rightarrow -\infty} \arctan\left(\frac{x+1}{x}\right)$.

[3]

(d) Calculate and simplify $f'(x)$ if $f(x) = x \cos^{-1}(x) - \sqrt{1-x^2}$.

[3]

Question 2 [10 points]:

(a) Simplify $\cosh(\ln 3)$. Your final answer should be a simple fraction not containing any functions.

[3]

(b) Determine $\lim_{x \rightarrow \infty} \frac{\cosh(x) \sinh(x)}{e^{2x}}$.

[3]

(c) Determine $\lim_{x \rightarrow 0} \frac{\tanh(4x)}{\sinh(7x)}$.

[4]

Question 3 [10 points]: Find the following limits if they exist:

(a) $\lim_{x \rightarrow 0} \frac{x + \tan(x)}{\sin(2x)}$

[3]

(b) $\lim_{x \rightarrow \infty} \frac{x^2}{e^x + x - 1}$

[3]

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

[4]

Question 4 [5 points]: Find the following limit if it exists:

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

[5]

Question 5 [5 points]: Suppose an object moves with acceleration $a(t) = 2\sqrt{t} + \frac{1}{t^2}$ m/s² where $t > 0$ represents time in seconds. If velocity $v(1) = 1/3$ m/s and displacement $s(1) = 2$ m, determine a formula for $s(t)$, the displacement at time t .

[5]

Question 6 [10 points]: Find the most general antiderivative of each of the following functions:

(a) $f(x) = 2x + \frac{3}{1+x^2} + \cos(x)$

[3]

(b) $f(x) = \frac{5 - 3x + x^3}{x}$

[3]

(c) $f(x) = \left(x + \frac{1}{x}\right)^2$

[4]