**Question 1:**

**(a)[3]** Determine $\lim_{x \to -\infty} \arctan(x^2)$.

**(b)[3]** Determine $\cos^{-1}(-\sqrt{3}/2)$ .

**(c)[4]** Let $f(x) = x \arcsin(x) + \sqrt{1-x^2}$ . Determine $f'(1/2)$.

**Question 2:**

**(a)[3]** Evaluate the limit if it exists: $\lim_{x\to 0} \dfrac{\tanh(3x)}{\sinh(5x)}$ .

**(b)[3]** Determine $f'(0)$ if $f(x) = \ln(\cosh(2x)) - \text{sech}(\ln(1+x))$ .

**(c)[4]** Does the equation $\sinh(x) = \cosh(x)$ have solutions? If so, find them. If not, explain why.

**Question 3:**

**(a)[5]** Evaluate the limit if it exists: $\lim_{x\to 0} \dfrac{x - \sin(x)}{\sin(x^2)}$

**(b)[5]** Evaluate the limit if it exists: $\lim_{x\to 0} \dfrac{\sqrt{1+x} - 1 - x/2}{x^2}$

**Question 4:**

**(a)[5]** Evaluate the limit if it exists: $\lim_{x \to 0^+} x(\ln(x))^2$

**(b)[5]** Evaluate the limit if it exists: $\lim_{x \to \infty} x^{(e^{-x})}$

**Question 5:** 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

$$\int_{-1}^{2} 3x^2\,dx$$

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