Question 1:

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

[3]

(b) Determine $\csc\left(\cos^{-1}\left(a/b\right)\right)$. Your final answer should be a fraction which does not contain any trigonometric or inverse trigonometric functions.

[3]

(c) Find all values of x at which the tangent line to $y = x\arctan\left(x/2\right) - \ln\left(x^2+4\right)$ has slope $\pi/4$.

[4]

Question 2:

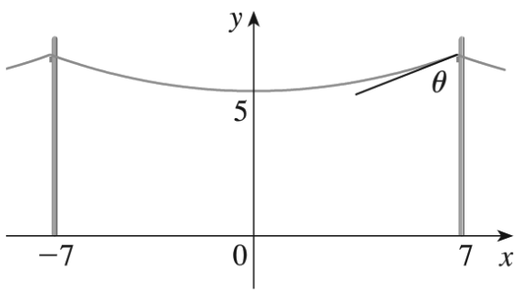
(a) Let $f(x) = \cosh(\tanh(x))$. Calculate and simplify $f'(0)$.

[2]

(b) Solve for x: $\sinh(x) = 2$.

[4]

(c) The cable hanging between the two poles in the figure below has equation $y = 20\cosh(x/20) - 15$. Determine the angle θ between the cabel and pole as shown in the figure. Express your final answer as a "calculator ready" expression using hyperbolic and inverse trigonometric functions.



[4]

Question 3: Find the following limits if they exist:

(a) $\lim_{x \to 0} \frac{8x^2}{\cos(x) - 1}$

[3]

(b) $\lim_{x \to 0^+} \frac{\ln(x^2 + 2x)}{\ln(x)}$

[3]

(c) $\lim_{x \to 0^+} \left(\frac{3x + 1}{x} - \frac{1}{\sin(x)} \right)$

[4]

Question 4: Find the following limit if it exists:

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

[5]

Question 5: Find $f(t)$ if $f''(t) = t - \cos(t)$ and $f'(0) = 2$, $f(0) = -2$.

[5]

Question 6: Find the most general antiderivative of each of the following functions:

(a) $f(x) = 5e^x + \dfrac{\cosh(x)}{2} + \sec^2(x)$

[3]

(b) $f(x) = \dfrac{1 + \sqrt{x} + x^2}{x}$

[3]

(c) $f(x) = \dfrac{2 + x^2}{1 + x^2}$ (Hint: $2 = 1 + 1$)

[4]