Question 1 [10 points]:

(a) Determine all values of the angle θ in $[0, 2\pi]$ such that $\sec(\theta) = 2$.

[3]

(b) Determine the exact value and simplify: $\sin(\pi/3) - \tan(3\pi/4)$

[3]

(c) Find all values of x in the interval $[0, 2\pi]$ that satisfy the equation $\sin x = \tan x$.

[4]

Question 2 [3 points]: A sphere (a ball) of radius r has volume $V = \frac{4}{3}\pi r^3$ and surface area $S = 4\pi r^2$. Express the volume V as a function of the surface area S.

[3]

Question 3 [4 points]: Let $f(x) = x^2 - 2x$. Evaluate and simplify the difference quotient $\frac{f(4+h) - f(4)}{h}$.

[4]

Question 4 [3 points]: Determine the domain of $f(x) = \frac{\sqrt{3x-1}}{x^2-9}$.

[3]

Question 5 [3 points]: Let $H(x) = \dfrac{1}{\sqrt{3-\cos(x)}}$. If $g(x) = 3 - x$, find functions $f(x)$ and $h(x)$ so that $H(x) = (f \circ g \circ h)(x)$.

[3]

Question 6 [3 points]: Let $f(x) = \sqrt{x+1}$ and $g(x) = \dfrac{1}{x^2-1}$. Determine $(g \circ f)(x)$ and state the domain.

[3]

Question 7 [3 points]: Evaluate the following limit if it exists: $\lim\limits_{x \to 0} \dfrac{\sin^2(x)}{\cos(3x) - \sin(2x)}$

[3]

Question 8 [11 points]: Evaluate the following limits, if they exist:

(a) $\lim_{x \to 1} \dfrac{\left(\dfrac{1}{x} - 1\right)}{x - 1}$

[4]

(b) $\lim_{h \to 0} \dfrac{\sqrt{5h + 4} - 2}{h}$

[4]

(c) $\lim_{x \to 2} \dfrac{x^2 + 5x + 6}{\sqrt{x + 2} - 2}$

[3]

Question 9 [10 points]: Evaluate the following limits, if they exist:

(a) $\lim_{t \to -1} \dfrac{t^2 - t - 2}{t^2 + 3t + 2}$

[5]

(b) $\lim_{x \to 0^+} \left(\dfrac{1}{x^2 + x} \right) - \dfrac{1}{x}$

[5]