Question 1:

(a)[3 points] Evaluate $\lim_{x\to\infty} \dfrac{x^3 - 2x + 3}{5 - 2x^3}$

(b)[3 points] Determine u': $u = \sqrt[4]{t^3} + 2\sqrt[3]{t^2}$

(c)[4 points] A ball with an initial velocity of 5 m/s rolls down a hill. The position of the ball after t seconds is $s(t) = 5t + 3t^2$ metres. How long does it take the velocity to reach 35 m/s?

Question 2:

(a)[3 points] Determine $\frac{dy}{dx}$: $y = \frac{1+\sin(x)}{x^2-\cos(x)}$

(b)[3 points] Determine $f'(x)$: $f(x) = \left(\sqrt{x}+3x^2\right)\tan(x)$

(c)[4 points] Determine $g''(0)$: $g(\theta) = \sec(\theta)$

Question 3:

(a)[3 points] Determine $\dfrac{dy}{dx}$: $y = (x^2+1)\sqrt[3]{x^2+2}$

(b)[3 points] Determine $f'(x)$: $f(x) = \dfrac{x}{\sqrt{7-3x}}$

(c)[4 points] Determine y': $y = \sin\left(\tan\sqrt{\sin(x)}\right)$

Question 4:

(a)[5 points] Find an equation of the tangent line to $y = \sqrt{1 + 4\sin(x)}$ at the point where $x = 0$.

(b)[5 points] Determine y' using implicit differentiation: $1 + x = \sin\left(xy^2\right)$

Question 5:

(a)[5 points] Suppose $h(x) = f(x)g(x)+[g(x)]^2$. If $f(2) = 3$, $f'(2) = -2$, $g(2) = 5$ and $g'(2) = 4$, calculate $h'(2)$.

(b)[5 points] Find all values of t at which tangent lines to the curve $y = \dfrac{t^2}{1+t}$ are horizontal.