Question 1:

(a)[3 points] Determine y' if $y = 5x^4 - \pi x + 6\sqrt{x} - \sqrt{2}$

(b)[3 points] Determine $\dfrac{dy}{dx}$ where $y = \left(3x^2 - \dfrac{1}{x}\right)\sec x$

(c)[4 points] Determine $f'(x)$ if $f(x) = \dfrac{\csc x - \sqrt[3]{x}}{\tan x + 2x^{1/2}}$

Question 2:

(a)[5 points] A particle moving along a straight line has position at time t given by $s(t) = 2t^3 - 12t^2 + t + 2$. Here $t \geq 0$ is in seconds and position is in metres. Determine the velocity of the particle when the acceleration is 0 m/s^2.

(b)[5 points] Determine the values of a and b for which the line $y = -2x + b$ is tangent to the parabola $y = ax^2$ when $x = 2$.

Question 3:

(a)[3 points] Find $\frac{dy}{dx}$ if $y = \sqrt[3]{x + \sqrt{x}}$

(b)[3 points] Find $\frac{dy}{dx}$ if $y = \sin(\sqrt{7x + \cos x})$

(c)[4 points] Compute $g''(\pi)$ if $g(\theta) = \theta^2 \cos\theta$

Question 4:

(a)[4 points] Determine $f'(x)$ if $f(x) = (1 - x^2)\cos\left(\frac{1}{x}\right)$

(b)[6 points] Find an equation of the tangent line to the curve $x\sin(xy - y) = \frac{x - y}{y}$ at the point $(1, 1)$.

Question 5 [10 points]: A splotlight on the ground shines on a wall 12 m away. If a man 2 m tall walks from the spotlight to the building at a speed of 2 m/s, how fast is the length of his shadow on the building decreasing when he is 4 m from the building?