Question 1:

(a)[7 points] Determine the linearization (or linear approximation) to $f(x) = \dfrac{1}{\sqrt{1+3x}}$ at $a = 0$.

(b)[3 points] Use your result from part (a) to estimate the value of $\dfrac{1}{\sqrt{1.03}}$.

Question 2:

(a)[3 points] Differentiate $y = e^{x^5 - \ln(x^2)}$.

(b)[3 points] Determine $f'(0)$ if $f(x) = \ln\left(\dfrac{e^x}{x^2+1}\right)$.

(c)[4 points] Determine $g'(x)$ if $g(x) = 5^{\sqrt{1-x}} + \log_5 \sqrt{x}$.

Question 3:

(a)[5 points] Use logarithmic differentiation to determine y' where $y = \dfrac{(x-1)^7}{x^{2x}}$.

(b)[5 points] Determine the equation of the tangent line to curve $y + x^2e^y = 1 + \ln(x + 3y)$ at the point $(1, 0)$.

Question 4: This question deals with the function $f(x) = e^{-\frac{1}{2}x^2}$. Note that f has domain all real numbers.

(a)[5 points] Determine the intervals of increase and decrease of f and state the relative extrema, if any.

(b)[5 points] Determine the intervals of concavity of the graph of $y = f(x)$ and state the inflection points, if any.

Question 5 [10 points]: Determine the absolute maximum and minimum values of $f(x) = (x^2 + 2x)^{1/3}$ on the interval $[-2, 2]$.