Math 108, Business Calculus
Quiz 2, Sections 2.1 and 2.2
Name ANSWER KEY A
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Show all work neatly. Use of calculators is not permitted. (Each problem is worth 4 points.)

1. Using the general (limit) definition of the derivative function, find the derivative of the function \( f(x) = x^2 - 4x + 3 \). You must show all work to receive credit for this problem.

\[
f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} \frac{(x+h)^2 - 4(x+h) + 3 - (x^2 - 4x + 3)}{h}
\]

\[
= \lim_{h \to 0} \frac{x^2 + 2xh + h^2 - 4x - 4h + 3 - x^2 + 4x - 3}{h}
\]

\[
= \lim_{h \to 0} \frac{2xh + h^2 - 4h}{h} = \lim_{h \to 0} \frac{h(2x + h - 4)}{h}
\]

\[
\lim_{h \to 0} \frac{2x + h - 4}{1} = \frac{2x - 4}{1}
\]

2. Using any correct technique, find the derivative of each of the following functions:
   a) \( f(x) = x^7 - 8x + \sqrt{13} \) (use power rule)

\[
f'(x) = 7x^6 - 8 = [7x^6 - 8]
\]

   b) \( g(x) = \sqrt{x^3} + \frac{1}{x^3} = x^{3/2} + x^{-3} \) (new function)

\[
g'(x) = \frac{3}{2} x^{3/2 - 1} - 3x^{-4} = \frac{3}{2} x^{1/2} - 3x^{-4}
\]
1. Using the general (limit) definition of the derivative function, find the derivative of the function \( f(x) = x^2 - 3x + 2 \). You must show all work to receive credit for this problem.

\[
\begin{align*}
    f'(x) &= \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \\
    &= \lim_{h \to 0} \frac{(x+h)^2 - 3(x+h) + 2 - (x^2 - 3x + 2)}{h} \\
    &= \lim_{h \to 0} \frac{x^2 + 2xh + h^2 - 3x - 3h + 2 - x^2 + 3x - 2}{h} \\
    &= \lim_{h \to 0} \frac{2xh + h^2 - 3h}{h} \\
    &= \lim_{h \to 0} (2x + h - 3) \\
    &= 2x - 3
\end{align*}
\]

2. Using any correct technique, find the derivative of each of the following functions:
   a) \( f(x) = x^5 - 6x + \sqrt{7} \) (using power rule)

\[
    f'(x) = 5x^4 - 6
\]

   b) \( g(x) = \sqrt{x^3} + \frac{1}{x^3} = x^{\frac{3}{2}} + x^{-3} \) (using quotient rule)

\[
    g'(x) = \frac{3}{2} \cdot x^{\frac{3}{2} - 1} - 3x^{-3-1} = \frac{3}{2} \sqrt{x} - 3x^{-4}
\]