



- I. Write TRUE if the statement is true. Otherwise, write FALSE. *1 point each*
- $x + 1$ is a factor of $4x^{20} + 8x^{13} - 2x^2 + 6$.
 - The polynomial $p(x) = -3x^5 + x^2 + 1$ has two negative roots.
 - If $f(x) = \sqrt{x}$ and $g(x) = x^2$, then the domain of $g \circ f$ is \mathbb{R} .
- II. Fill in the blanks with the correct terms to complete the statement. *3 points each*
- Let $f(x) = \frac{2-x}{3x-1}$. Then $f^{-1}(x) = \underline{\hspace{2cm}}$ and the range of f is $\underline{\hspace{2cm}}$.
 - Let $a = \log 2$ and $b = \log 7$. Then $\log 3920000$ is equal to $\underline{\hspace{2cm}}$ (in terms of a and b)
- III. Solve for x . *5 points each*
- $4x^4 + 8x^3 + 11x^2 + 10x + 3 = 0$
 - $\frac{3^{(x+1)^2}}{81} = 3^{x-1}$
 - $\log_4(x+2)^2 - \log_2(x-2) = 2$
- IV. Let $f(x) = \begin{cases} -2x+1, & x < 0 \\ x^2 - 2x + 3, & x \geq 0 \end{cases}$
- Sketch the graph of f . Label all important points. *3 points*
 - Find the domain and range of f . *2 points*
- V. Solve the following problems systematically.
- The crushing weight of a pillar varies directly as the fourth power of the diameter D and inversely as the square of the height H of the pillar. If 200 tons will crush a pillar 10 inches in diameter and 20 feet high, find the weight that will crush a pillar 12 inches in diameter and 12 feet high. *3 points*
 - Find the sum of all integers between 32 and 395 which are divisible by 7. *4 points*
 - A vacuum pump removes 80% of the air in a container at each stroke. After 6 strokes, what part of the original amount remains in the container? *4 points*