PCFU CP: C11 Long Division Name: ______________________________

1. Evaluate $9x^3 - 48x^2 + 3 \div x - 5$

<table>
<tr><td>First I have to set up the division problem, but since I am missing the x-term, I will need a placeholder (0x).</td><td>$x - 5\,\overline{)9x^3 - 48x^2 + 0x + 3}$</td></tr>
<tr><td>1) Divide: To begin any long division problem, I must divide the first term in the dividend (9x³) by the first term in the divisor (x).
$9x^3/x = 9x^2$
$9x^2$ goes on the top as the first term of the quotient.</td><td>$9x^2$
$x - 5\,\overline{)9x^3 - 48x^2 + 0x + 3}$</td></tr>
<tr><td>2) Multiply: I must multiply $9x^2$ by x-5, making sure I distribute. $9x^2(x-5) = 9x^3 - 45x^2$. This goes under the first two terms of the dividend.</td><td>$9x^2$
$x - 5\,\overline{)9x^3 - 48x^2 + 0x + 3}$
$9x^3 - 45x^2$</td></tr>
<tr><td>3) Subtract: I must subtract the binomial $9x^3 - 45x^2$ from the first two terms of the dividend to get $-3x^2$ and I bring down the next term (0x).</td><td>$9x^2$
$x - 5\,\overline{)9x^3 - 48x^2 + 0x + 3}$
$\underline{-(9x^3 - 45x^2)}$
$-3x^2 + 0x$</td></tr>
<tr><td>Now I just repeat steps 1, 2, and 3 until I get to the last term:
<table><tr><td>$\frac{-3x^2}{x} = -3x$</td><td>$-3x(x-5)$
$-3x^2 + 15x$</td></tr><tr><td>$\frac{-15x}{x} = -15$</td><td>$-15(x-5)$
$-15x + 75$</td></tr></table>The remainder (-72) becomes the numerator of the fraction with the divisor (x-5) as the denominator.</td><td>$9x^2 - 3x - 15 - \frac{72}{x-5}$
$x - 5\,\overline{)9x^3 - 48x^2 + 0x + 3}$
$\underline{-(9x^3 - 45x^2)}$
$-3x^2 + 0x$
$\underline{-(-3x^2 + 15x)}$
$-15x + 3$
$\underline{-(-15x - 75)}$
-72</td></tr>
</table>

2. Is $x - 5$ a factor of $9x^3 - 48x^2 + 3$? How do you know?

No, because whenever the remainder is something other than 0, it means that the dividend is not divisible by the divisor. When the division leaves me with a remainder of 0, I know that I have found one of the factors of the polynomial.

Additional Practice

1. Evaluate $4x^3 - 11x - 35 \div 2x - 5$ following the steps below.

a) Before you set up the problem, check to see if you are missing any terms in the dividend. Write the dividend with a placeholder for the missing term(s).

b) On the top of the back of this sheet, set up the long division problem with the $2x - 5$ on the outside and the altered dividend with the placeholder on the inside.

c) Which two terms should you use to begin the division process? _________ and _________Divide these two terms. What did you get? __________ Write your answer on the top of the division bar.

d) Now multiply the term you just wrote above the long division bar with the divisor: $2x - 5$. What did you get? _______________ Place the result under the first two terms of the dividend.

e) Now subtract those two terms from the ones above. REMEMBER to subtract BOTH terms. What did you get? _______________

f) Bring down the next term.

g) Repeat steps c) through f) as many times as necessary.

h) Is there a remainder? What does that mean?

2) Divide $9x^3 - 48x^2 + 3$ by $x - 5$ using long division.