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MATH 407: HW 13

4.2 **1** Use the division algorithm to find the quotient and remainder when $f(x)$ is divided by $g(x)$ over the field of rational numbers $\mathbb{Q}$.

c $f(x) = x^5 + 1$, $g(x) = x + 1$

Pf. ☐

2 Use the division algorithm to find the quotient and remainder when $f(x)$ is divided by $g(x)$ over the indicated field.

c $f(x) = x^5 + 2x^3 + 3x^2 + x - 1$, $\quad g(x) = x^2 + 5$ over $\mathbb{Z}_5$

Pf. ☐

3 Find the greatest common divisor of $f(x)$ and f', over $\mathbb{Q}$.

d $f(x) = x^4 + 2x^3 + 3x^2 + 2x + 1$

Pf. ☐

5 Find the greatest common divisor of the given polynomials, over the given field.

c $f(x) = x^5 + 4x^4 + 6x^3 + 6x^2 + 5x + 2$, $\quad x^4 + 3x^2 + 3x + 6$ over $\mathbb{Z}_7$

Pf. ☐

9 Let $a \in \mathbb{R}$, and let $f(x) \in \mathbb{R}[x]$, with derivative $f'(x)$. Show that the remainder when $f(x)$ is divided by $(x - a)^2$ is $f'(a)(x - a) + f(a)$.

Pf. ☐

11 Find the irreducible factors of $x^6 - 1$ over $\mathbb{R}$.

Pf. ☐

18 Compute the following products.

b $(a + bx)(c + dx) \equiv ???\ (\mathrm{mod}\ x^2 - 2)$ over $\mathbb{Q}$.

Pf. ☐