**CYCLE #6 Fun, Fun, Fun with Functions**

Show all work. No Calculator

I. **Multiple Choice**

_____ 1. If $p(x)=(x+2)(x+k)$ and if the remainder is 12 when $p(x)$ is divided by $x-1$, then $k=$

(A) 2 (B) 3 (C) 6 (D) 11 (E) 13

_____ 2. If $f(x)=\dfrac{4}{x-1}$ and $g(x)=2x$, then the solution set of $f(g(x))=g(f(x))$ is

(A) $\left\{\dfrac{1}{3}\right\}$ (B) $\{2\}$ (C) $\{3\}$ (D) $\{-1,2\}$ (E) $\left\{\dfrac{1}{3},2\right\}$

_____ 3. If the function $f$ is defined by $f(x)=x^5-1$, then $f^{-1}$, the inverse function of $f$, is defined by $f^{-1}(x)=$

(A) $\dfrac{1}{\sqrt[5]{x}+1}$ (B) $\dfrac{1}{\sqrt[5]{x+1}}$ (C) $\sqrt[5]{x-1}$ (D) $\sqrt[5]{x}-1$ (E) $\sqrt[5]{x+1}$

_____ 4. If $a$, $b$, $c$, $d$, and $e$ are real numbers and $a \neq 0$, then the polynomial equation $ax^7 + bx^5 + cx^3 + dx + e = 0$ has

(A) only one real root (B) at least one real root (C) an odd number of nonreal roots
(D) no real roots (E) no positive real roots

_____ 5. If $f(x) = 2x^3 + Ax^2 + Bx - 5$ and if $f(2) = 3$ and $f(-2) = -37$, what is the value of $A + B$?

(A) $-6$ (B) $-3$ (C) $-1$ (D) 2 (E) cannot be determined from given info

_____ 6. Dividing the polynomial $f(x) = x^3 + 3x^2 - 12$ by the polynomial $p(x) = x + 1$ gives a remainder of what?

(A) 0 (B) $-10$ (C) 10 (D) $-8$ (E) none of these

_____ 7. Find the inverse of the function $f(x) = \dfrac{3x+2}{x}$, where $x \neq 0$. $f^{-1}(x) =$

(A) $\dfrac{1}{3x}$ (B) $\dfrac{x}{2x-3}$ (C) $\dfrac{x}{2x+3}$ (D) $\dfrac{2}{x-3}$ (E) none of these

II. **Free Response**

8. Divide $f(x)=x^3+2x^2-8x-5$ by $x^2+3$. State the quotient and remainder

9. For $f(x)=\dfrac{6x+4}{4x+5}$

(a) Find the inverse function of *f*.

(b) Do long division on both *f* and $f^{-1}$, and rewrite each as a transformation of a parent function.

(c) Graph both *f* and $f^{-1}$ on the same set of coordinate axes (without using a calculator).

(d) Describe the relationship between the graphs of *f* and $f^{-1}$.

(e) State the domain and range of both *f* and $f^{-1}$.

10. For $f(x) = 2x^2 - kx^2 + 3x - k$, find the value of $k$ so that when $f(x)$ is divided by $x+1$ the remainder is $\frac{2}{3}$.