MATH 243 Prerequisite Quiz

1. Find the product $(x^2 + x - 2)(3x^2 - 8x - 7)$ and simplify all the terms. After you have done so, let the resulting polynomial be $f(x)$. What is the value of $f(2)$?

2. If $x = \frac{-30}{-78}$, then $x = \frac{a}{b}$ in lowest terms. Find $a + b$

3. Let x be the solution to $\frac{5x}{3x-3} + \frac{6}{x+2} = \frac{5}{3}$. If $x = \frac{a}{b}$ in lowest terms, find $a + b$

4. John can paint a house in 28 hours. John and Dave can paint the house in 17 hours working together. How long would it take Dave to paint it himself? If the answer is $x = \frac{a}{b}$ hours in lowest terms, find $a + b$

5. Find the value of c such that the equation $x^2 - 18x + c = 0$ only has one distinct solution for x

6. Find the radius of the circle described by $9x^2 + 9y^2 - 6x - 36y - 107 = 0$

7. Divide $x^3 + x^2 + x + 1$ by $x + 9$. What is the remainder for this division?

8. Solve $\log(x) = \log(100) - \log(x - 21)$ for x

9. Solve the system of 3 linear equations $\{2x + 5y + 2z = -38, 3x - 2y + 4z = 17, -6x + y - 7z = -12\}$. What is the value of z?

10. Evaluate $\lim\limits_{x \to 1} \frac{x^3 - 1}{x^2 - 1}$ without using L'Hopital's Rule. If the answer is $\frac{a}{b}$ in simplest terms, find $10a + b$

11. Consider $f(x) = \arctan(1/x)$. Let $a = \lim\limits_{x \to \infty} f(x), b = \lim\limits_{x - > -\infty} f(x), c = \lim\limits_{x \to 0^+} f(x), d = \lim\limits_{x - > 0^-} f(x)$. Let $k = 3a + 3b + 2c + 2d$. Find the value of k

12. Let $c = \int_0^1 (x^e + e^x)\, dx$. What is the integer closest to c?

13. Find $\int_{-1}^1 \frac{\sin(x)}{1+x^2}\, dx$

14. Let y satisfy the differential equation $\frac{dy}{dt} = y(3 - y)$. If we also know that $y(0) = 1$, solve for y. Once you have solved for y, find $\lim\limits_{t \to \infty} y(t)$

15. Let $k = \int_0^\infty \frac{dx}{1+x^3}$. We can write $k = \frac{a\pi}{b^{c/d}}$ where $\frac{c}{d}$ is in lowest terms and a, b share no common factors. Find $1000a + 100b + 10c + d$

16. Let $f(x) = \frac{1}{x+1} + \cos(2x)$. Let $g(x)$ be the 6th derivative of f. Find $g(0)$

17. Let L be the arc length of the parabola $y = x^2$ from $x = 0$ to $x = 1$. We have $L = \frac{\sqrt{a}}{b} + \frac{\ln(c + \sqrt{5})}{d}$ for integers a, b, c, d. What is the value of $1000a + 100b + 10c + d$?