Texas A&M University Mathematics Practice Placement Exam

1. Find the x and y intercepts for the function $f(x) = x^3 - 9x$.
2. Find the domain of:
   (a) $f(x) = \sqrt{-x^2 - 4x + 5}$
   (b) $g(t) = \ln(4t - 3)$
   (c) $h(x) = \dfrac{1}{x^3 + 3x^2 - x - 3}$
3. Simplify the expression. Write your answer using positive rational exponents. $\left(\dfrac{2}{\sqrt{x^5}}\right)\left(\sqrt[3]{4x}\right)$
4. If we begin with the graph of $f(x) = \sqrt{x}$, shift 4 units to the right, shrink vertically by a factor of $\dfrac{1}{2}$, and shift upward 10 units, write an equation for the transformed graph.
5. Solve for x: $\log(x + 2) + \log(x - 1) = 1$.
6. Factor completely: $3x^2(4x^2 + 1)^8 + 64x^4(4x^2 + 1)^7$.
7. How far from the base of an 18 foot tall pole must a person be standing if the angle of elevation from the ground to the pole is 41°?
8. Find $f \circ g$ if $f(x) = \dfrac{x}{x + 1}$ and $g(x) = \dfrac{2}{x}$. Simplify.
9. Perform the indicated operation and simplify: $\dfrac{8}{x + 1} - \left(\dfrac{y}{z + 2} \div \dfrac{y - 4}{w}\right)$
10. Solve for x: $e^{2x} - 2e^x - 3 = 0$.
11. Find the equation of the line passing through the point $(5, 1)$ with slope 7. Next, find y when $x = -4$.
12. If $f(x) = \sqrt{x + 4}$, find and simplify $\dfrac{f(2 + h) - f(2)}{h}$.
13. Simplify $\dfrac{(x^2y^4)^5(x^3y)^{-3}}{xy}$.
14. Simplify $\sqrt[3]{a^3b}\sqrt[3]{64a^4b^2}$.
15. Perform the operations and simplify.
    $\dfrac{x^2}{x^2 - x - 2} - \dfrac{4}{x^2 + x - 6} + \dfrac{x}{x^2 + 4x + 3}$.

16. Find all zero's and vertical asymptotes for $f(x) = \dfrac{3x^2 - 14x - 5}{4x^2 - 17x - 15}$

17. If θ is in quadrant II and $\sin\theta = \dfrac{1}{7}$, what is $\cos\theta$?

18. Use properties of logarithms to expand the expression $\ln\left(\dfrac{\sqrt{x}y^5}{(z+1)^4}\right)$.

19. Evaluate $\sec\dfrac{2\pi}{3} - \tan\dfrac{\pi}{6}$.

20. If we begin with a rectangle with length 5 inches and width 4 inches, then increase the length by 8%, what is the change in area?

21. Evaluate $f(2) - f(-3)$ If

$$f(x) = \begin{cases} x^3 + 1 & , \text{ if } x > 1 \\ 2x^2 - 3 & , \text{ if } x \leq 1 \end{cases}$$

22. Simplify the expression $\dfrac{\cos^2\theta}{1 + \sin\theta}$.

23. Evaluate $\log_4 \dfrac{1}{\sqrt[3]{16}}$.

24. Simplify $\dfrac{\frac{1}{a} - b}{\frac{1}{b^3} + a}$.

25. A bacteria culture contains 1200 bacteria and doubles every day. How many hours will it take the culture to reach 10000 bacteria?