PRACTICE ADVANCED STANDING EXAM

1. Find the $x$ and $y$-intercepts for the following:

   \[ x^2 = 1000 - y^3 \]

   $x$-int: \hspace{1cm} $y$-int:

2. Find the equation of the line (in $y = mx + b$ form) that passes through the following points: $(2,1)$ and $(4,-5)$

3. Give the domain of the following functions:

   \[ f(x) = \frac{x-9}{x^2-x-12} \]

   \[ g(x) = \sqrt{200 - 40x} \]
4. Graph the following piecewise function:

\[ f(x) = \begin{cases} 
  x^2 & \text{if } x \leq 2 \\
  -\frac{3}{2}x + 4 & \text{if } x > 2 
\end{cases} \]

(Hint: It may help to graph the pieces separately first.)

5. Find the coordinates of the vertex:

\[ f(x) = 4(x + 3)^2 + 5 \quad \quad \quad f(x) = 5x^2 - 10x + 7 \]

6. Divide the following polynomials and find a Quotient and a Remainder:

\[ \left(2x^3 + 7x^2 - 10x - 1\right) \div (2x - 1) \]
7. Identify the vertical and horizontal asymptotes:

\[ f(x) = \frac{x-3}{x^2-4} \quad f(x) = \frac{2x^2-3}{x^2-12x+35} \]

8. Solve the following Inequality:

\[ \frac{2}{x+2} \geq \frac{1}{x-1} \]

9. Perform the indicated function compositions using the following formulas:

\[ f(x) = x + 1 \quad g(x) = x^2 - 5 \]

\[ (g \circ f)(x) = \]

\[ (g \circ f \circ f)(0) = \]
10. Find the inverse of the following function:
   [Be sure to indicate if there are any restrictions on the domain of the inverse.]

   \[ f(x) = \sqrt{x - 2} \] \hspace{2cm} \[ f^{-1}(x) = \]

   Domain:

11. Solve the following equations:

   \[ 2^{x+2} = 32 \]

   \[ \ln(x - 4) = 2 \]

   Solve for \( x \):

12. \[ \log(x - 3) + \log x = 1 \]
13. Convert the following into the specified units:

20 degrees = _______ radians

\(\frac{\pi}{18}\) radians = _______ degrees

14. Find the exact value of the following:
[Note: The angles are in radians.]

\[\sec \frac{3\pi}{4} = \quad \cot \frac{7\pi}{3} = \quad \sin(4\pi) = \]

15. Graph the following trig function:
Be sure to label your axes appropriately. [Note: The angles are in radians.]

\[f(x) = 3\sin \left(\frac{1}{30} x\right)\]
Amp:
Period:
16. Write an equation that describes the above graph:
   [Note: The angles are in radians and there is no phase shift.]

17. Find the exact value of the given trig function:
   (Note: The angles are measured in radians.)

   \[ \cos\left[\cos^{-1}\left(\frac{1}{2}\right)\right] = \]

   \[ \cos^{-1}\left[\cos\left(\frac{4\pi}{3}\right)\right] = \]

   \[ \cos\left[\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)\right] = \]

18. Prove the following trigonometric identity:

   \[ \cot \theta + \frac{\sin \theta}{1 + \cos \theta} = \csc \theta \]
Find the exact value of the following:

19. \( \sin\left(\cos^{-1}\left[\frac{4}{5}\right] + \tan^{-1}\left[\frac{2}{3}\right]\right) = \)

Use the following formulas to help answer the question above:

**Angle Sum & Difference Formulas:**

\[
\begin{align*}
\sin(A + B) &= \sin A \cos B + \cos A \sin B \\
\sin(A - B) &= \sin A \cos B - \cos A \sin B \\
\cos(A + B) &= \cos A \cos B - \sin A \sin B \\
\cos(A - B) &= \cos A \cos B + \sin A \sin B
\end{align*}
\]

20. Find all solutions in the interval \( 0 \leq \theta < 2\pi \):

[Note: The angles are measured in radians.]

\[2 \sin^2 \theta + 5 \sin \theta - 3 = 0\]
21. Find the value of $\theta$ [in radians] in the First Quadrant where $\cos \theta = \frac{1}{2}$, then find the values of the other five trig functions for that same angle $\theta$.

\[
\cos \theta = \frac{1}{2} \quad \theta = 
\]

\[
\sin \theta =
\]

\[
\tan \theta =
\]

\[
\sec \theta =
\]

\[
\csc \theta =
\]

\[
\cot \theta =
\]