1. Find the exact values of
   
a) \( \sin \frac{4\pi}{3} \)
   
b) \( \cot \frac{5\pi}{4} \)

   [3] [3]

   c) \( \tan \left( \arcsin \frac{2}{5} \right) \)

   [5]


   a) \( e^{2x} - e^x - 6 = 0 \)
   
   b) \( 5 \ln(2x - 8) = 4 \)

   [6]

   c) \( x^2 - 4x - 12 > 0 \). Give solution in interval notation.
[12] 3. Suppose \( \sin \theta = \frac{2x}{3} \) for some acute angle \( \theta \). Express in terms of \( x \).

   a) \( \cos \theta \)  
   b) \( \sin(2\theta) \)

[12] 4. Solve each equation on the interval \( 0 \leq \theta < 2\pi \).

   a) \( \cos \theta = -\frac{1}{2} \)  
   b) \( \sin(2\theta) = 0 \)

[7] 5. Find all solutions to \( \cos(2\theta) = \frac{1}{2} \).
6a. Graph over one period. Clearly label each graph pointing out $x$-intercepts and maximum and minimum points.

\[ y = -3\sin(2x) \]

6b) Given \( f(x) = 3\cos(4x - 3) \) state the information:

a) Period: 

b) Amplitude: 

c) Phase shift.

7) Use the graph of \( y = f(x) \) to answer the following: 

a) Give the interval(s) on which \( f(x) \) is increasing 

b) Give the coordinates of the relative maxima 

c) Give the range in interval notation.

8) Factor completely

a) \( x^4 - 7x^2 - 144 \)

b) \( x^4 + 64x \)
[14] 9. Establish the identity:

\[ \text{a)} \quad \frac{1}{1 - \sin x} - \frac{1}{1 + \sin x} = \frac{2 \tan x}{\cos x} \quad \text{b)} \quad \frac{\cos^2 \theta}{1 + \sin \theta} = 1 - \sin \theta \]


\[ \text{a)} \quad \frac{-2x}{x^2 + 9x + 18} \quad \text{b)} \quad \frac{3x^2 + 10x - 1}{x^3 + x^2 - 2x} \]
11. Graph \( r = 2 + 2\cos \theta \).

12. Graph \( f(x) = \frac{2x-3}{x+4} \)

   a) State the domain of \( f(x) \)

   b) Find the zero(s)

   c) Find the \( y \)-intercept

   d) Find the horizontal asymptote, if any.

   e) Find the vertical asymptote, if any.

   f) Sketch the graph. Label intercepts and dash in asymptotes.
[20] 13. Compute the value of each of the following limits. In the case that the limit is not a finite number, determine whether it is $+\infty$ or $-\infty$.

a) \[ \lim_{x \to 1} \frac{x^2 + x - 2}{x^2 - 4x + 3} \]

b) \[ \lim_{x \to \infty} \frac{-2x^2 - 2}{x^2 - 1} \]

c) \[ \lim_{x \to 9} \frac{\sqrt{x} - 3}{x - 9} \]

d) \[ \lim_{x \to 0} \frac{1}{x + 4} - \frac{1}{4} \]

[7] 14. Suppose \( f(x) = -x^2 + 2x - 3 \).

a) Find \( f(x + h) \).

b) Compute \( \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \).
15. Put the letter of the corresponding graph in the answer blank:

a) \( f(x) = -2x(x - 1)(x - 2)^2 \)  Letter of Graph Choice __________
b) \( f(x) = 2x(x - 1)^2(x - 2) \)  Letter of Graph Choice __________
c) \( f(x) = -2x^2(x - 1)(x - 2) \)  Letter of Graph Choice __________
[18] 16. Graph (You must label at least 3 points and/or any asymptotes, if applicable). Fill in information.

   a) \( y = -x^2 - 2x + 3 \)

      Vertex:

      Zeros:

      y-intercept:

   b) \( y = -e^x + 3 \)

      y-intercept:

   c) \( y = \ln(x - 4) \)

      Equation of asymptote:

      x-intercept:
[15] 17. Evaluate the following.

\[
\begin{align*}
\text{a)} & \quad \lim_{x \to 3} f(x) \\
\text{b)} & \quad \lim_{x \to 3} f(x) \\
\text{c)} & \quad \lim_{x \to 3} f(x) \\
\text{d)} & \quad \lim_{x \to 0} f(x) \\
\text{e)} & \quad \lim_{x \to 0} f(x)
\end{align*}
\]