

1. [16] Find the exact values of

a) $\sin 480^\circ$

c) $\sec \frac{5\pi}{6}$

b) $\tan \left(\cos^{-1} \left(\frac{\sqrt{2}}{2} \right) \right)$

d) $\cot \left(90^\circ + \frac{\pi}{4} \right)$

2. [12] If $\tan x = \frac{2}{3}$ in Quadrant III, find each of the following:

a) $\cos x$

b) $\csc x$

c) $\sin(2x)$

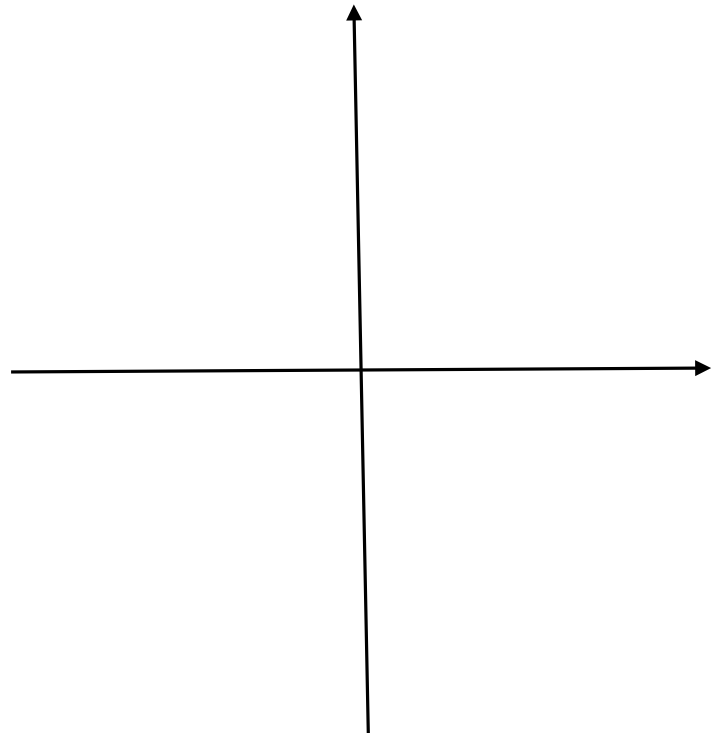
3. [14] Decompose into partial fractions:

a) $\frac{6x}{2x^2 + x - 1}$

b) $\frac{-x^2 + 26x + 6}{(2x - 1)(x + 2)^2}$

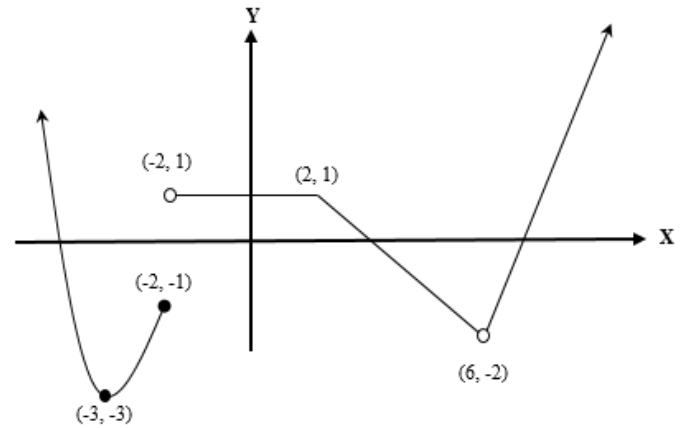
4. [9] Graph $f(x) = \frac{x(x+1)}{(x-5)(x+1)} = \frac{x^2 + x}{x^2 - 4x - 5}$ indicating the following clearly or write "none":

- Domain:
- y-intercept:
- Zeros:
- VA:
- HA:
- Hole:



5. [10] Evaluate the following limits using the given graph of $f(x)$:

- $\lim_{x \rightarrow -2^-} f(x) =$
- $\lim_{x \rightarrow -2^+} f(x) =$
- $\lim_{x \rightarrow -2} f(x) =$
- $\lim_{x \rightarrow 2} f(x) =$
- Relative minima :



6. [25] Evaluate the following limits:

- $\lim_{x \rightarrow 3} (1 - 4x) =$
- $\lim_{x \rightarrow 2} \frac{(3x^2 - 2x + 1)}{x - 2} =$
- $\lim_{x \rightarrow \infty} \frac{(3x^2 - 2x + 1)}{x - 2} =$
- $\lim_{x \rightarrow 3^+} 5 =$
- $\lim_{x \rightarrow 9} \frac{\sqrt{x} - 3}{x - 9} =$

7. [7] From the top of a lighthouse 50 meters above the surface of the water, the angles of depression of two ships due east are 15° and 20° , respectively. Find the distance between the two ships.

8. [12] Establish the identity. **Choose any two. Circle the two you want graded or the first two will automatically be chosen:**

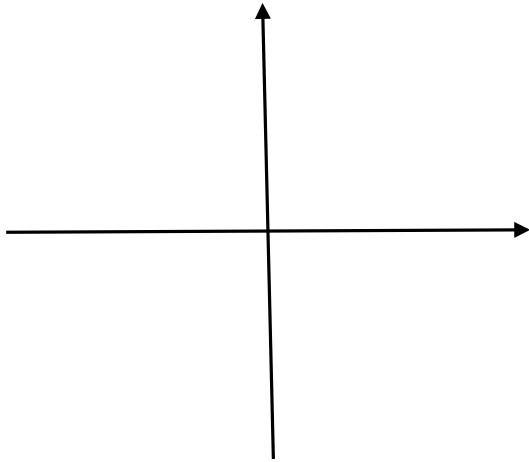
a) $\cos 3\theta = 4\cos^3 \theta - 3\cos \theta$

b) $\tan \theta + \frac{1}{\tan \theta} = \frac{1}{\cos \theta \sin \theta}$

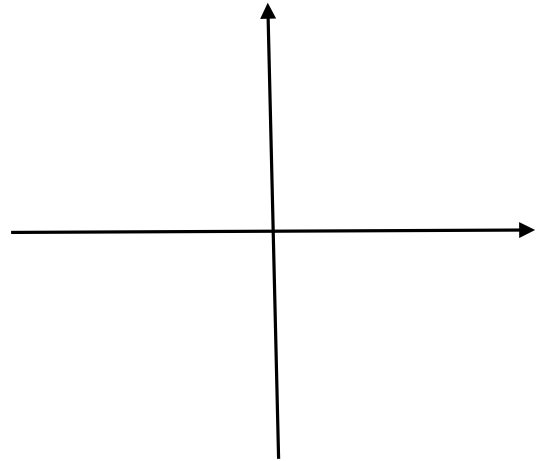
c) $\cos^2 x \cot^2 x = \cot^2 x - \cos^2 x$

9. [20] Graph each of the following. Label intercepts where appropriate. Dash in VA and HA (if they exist):

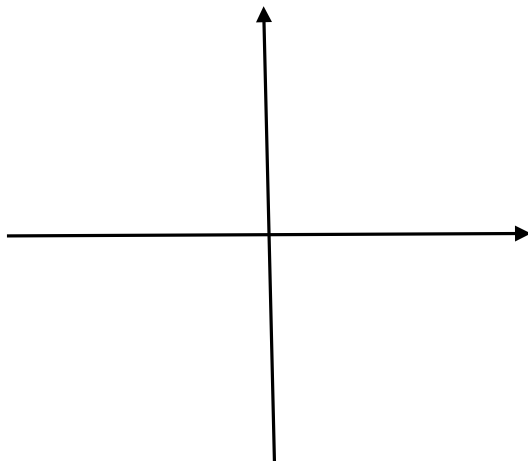
a) $y = e^{-x} + 1$



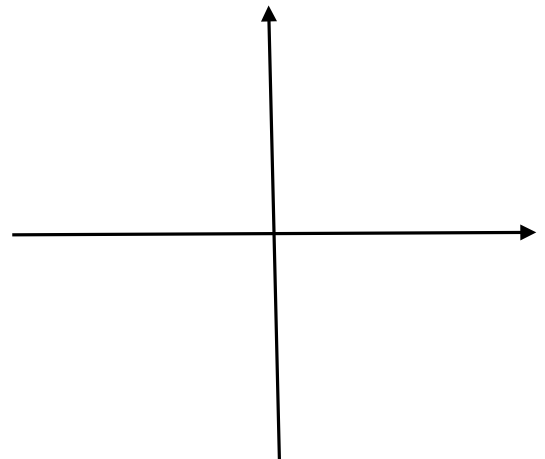
c) $y = |\ln x|$



b) $y = \ln(x + 3)$



d) $y = (x + 1)(x - 1)^2$



10. [6] State the domain and the range of following inverse functions:

a) $\cos^{-1} x$

Domain:

Range:

b) $\tan^{-1} x$

Domain:

Range:

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11. [18] Solve the following for x . Show all work clearly for credit.

a) $\tan x = -1$

b) $\sin x \cos x = 3 \cos x$ in $[0^\circ, 360^\circ)$.

c) $3 \cos^2 x + 4 \cos x - 1 = 0$ in $[0^\circ, 360^\circ)$.

12. [5] Use Intermediate Value Theorem to check whether $f(x) = x^2 - 2x - 1$ has at least one zero between $x = -1$ and $x = 1$. Explain your answer.

13. [6] **Choose one from a and b.** You may leave your answers in exact form.
- a) John invested \$1000 in a savings account at interest rate k , compounded continuously. The amount grows to \$1200 after 3 years. Find the value of k .
 - b) Scientists discovered a bone while dredging a creek in 1970. They found that the bone had lost 80% of its carbon-14. If the decay rate of carbon-14 is 0.00012, how old was the bone at the time it was discovered?

14. [12] Solve the following inequalities and write the answer in interval notation. Show all work:

a) $|3x + 1| - 2 \leq 2$

b) $x^2 + x - 6 > 0$

15. [14] Graph the following functions. Include one complete period. Label four ticks on x-axis and one on y-axis:

a) $y = -2 \sin 2x$

Amplitude:

Period:

Phase shift:

b) $y = \sin\left(x + \frac{\pi}{4}\right)$

Amplitude:

Period:

Phase shift:

16. [14] Consider $r = 1 + 2 \cos \theta$ and $r = 4 \cos \theta$

a) Find all points of intersection. Only an algebraic solution will receive full credits:

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b) Graph $r = 1 + 2 \cos \theta$. (Use the table if needed)

θ	$1 + 2 \cos \theta$
0°	
30°	
60°	
90°	
120°	
150°	
180°	
210°	
240°	
270°	
300°	
330°	

