

EXAM INSTRUCTIONS

- Exam Time: 2 hours
- Your cell phone must be off. You cannot use a calculator.
- You must show all your work. Work neatly on a different piece of paper showing clearly the question number and section, for example: 1a.

1. (10) Let $f(x) = e^{x-3} + 4$. Answer the following questions, in some cases the answer could be NONE or N/A.

- Sketch the graph
- Domain and Range
- X and y intercepts
- The equation of the horizontal and vertical asymptotes
- End behavior and behavior near vertical asymptotes.

2. (10) Find the domain of the following functions:

a. $h(x) = \sqrt{\frac{x^2 + 2x - 3}{x - 4}}$

b. $f(x) = \ln x + \ln(2 - x)$

3. (20) Solve the following equations.

- $3xe^x + x^2e^x = 0$
- $4 + 3\log(2x) = 16$

Choose two out of the following three equations

- $\sin 2x + \cos x = 0$ in the interval $[0, 2\pi)$
- $2 \cos^2 x + \sin x = 1$ in the interval $[0, 2\pi)$
- $\cos x + 1 = \sin x$ in the interval $[0, 2\pi)$

4. (16) Find the exact value of the following trigonometric functions:

- $\cos\left(\frac{25\pi}{4}\right)$
- $\sec(-13\pi)$
- $\sin 15^\circ$
- $\cos 10^\circ \cos 80^\circ - \sin 10^\circ \sin 80^\circ$

5. (6) Find the amplitude, period, and phase shift. State the domain and range.

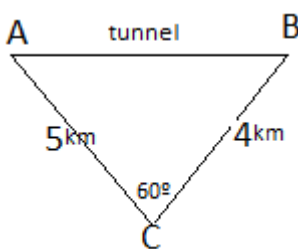
$$y = \frac{3}{4} \cos\left(2x + \frac{2\pi}{3}\right)$$

6. (6) Find the period and graph the following function showing any important points and vertical asymptotes. State the domain and range.

$$y = \tan 2(x - \pi/4)$$

7. (9) Sketch a triangle to evaluate $\cos(2 \tan^{-1}(3/2))$

8. (15) A tunnel is to be built through a mountain. To estimate the length of the tunnel, distance between A and B, a surveyor makes the following measurements: distance between A and C ≈ 5 km; distance between B and C ≈ 4 km; angle $ACB \approx 60^\circ$. Find the length of the tunnel.



9. (8) Choose either a or b and verify the equality.

a. $\cos^2 x - \sin^2 x = 2 \cos^2 x - 1$

b. $2 \tan x \sec x = \frac{1}{1 - \sin x} - \frac{1}{1 + \sin x}$

EXTRA CREDIT

10. (10) Given the function $f(x) = \tan(2x)$
- State the domain so that $f(x)$ is one-to-one.
 - State its range.
 - Find $f^{-1}(x)$ and state its domain and range.