Math 160 - Test #2 Info and Review Exercises

Fall 2018, Prof. Beydler

Test Info

- Date: Thursday, October 25, 2018
- Will cover packets #12 to #21.
- You'll have the entire class to finish the test.
- This will be a 2-part test. Part 1 will be **no calculator**. Part 2 will be **scientific calculator only**.
- No notes, no books, no phones during the test.
- There will be a seating chart for the test.
- Where to get help as you're studying:
    - Office hours
    - TMARC, LAC, or other tutoring centers
    - E-mail me at dbeydler@mtsac.edu

Review Exercises

Note: If you write up solutions to all of the review exercises listed below, and hand them in at the test, you can earn up to 2% extra credit towards your test! It is important to understand that these review exercises are not guaranteed to cover all of the potential problems on the test. Please review the notes, previous quizzes, and homework problems to fully prepare for the test.

Types of problems that will appear on Part 1 are labeled **NC** (for **N**o **C**alculator).

1. Let $f(x) = \frac{x}{x-1}$ and $g(x) = \sqrt{x}$.

a) Find $(f \circ g)(0)$.

b) Find $(g \circ f)(-2)$.

c) Find $(f \circ f)(1)$.

d) Find $f \circ g$ and its domain.

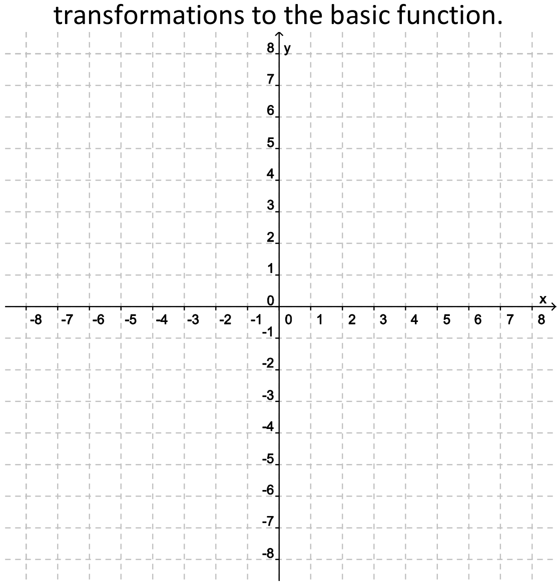
e) Find $g \circ f$ and its domain.

f) Find $g \circ g$ and its domain.

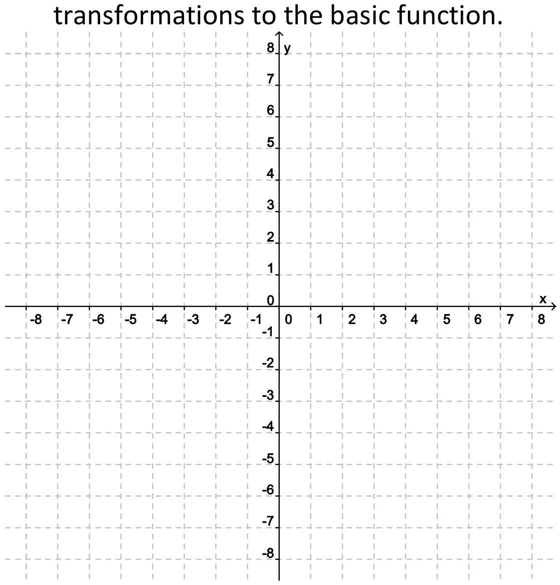
2. Find the inverse of $f(x) = \frac{2-x}{3x+4}$. Be sure to state the domain of $f^{-1}(x)$. (**NC**)

3. Find the inverse of $f(x) = 1 - \sqrt{x+5}$. Be sure to state the domain of $f^{-1}(x)$. (**NC**)

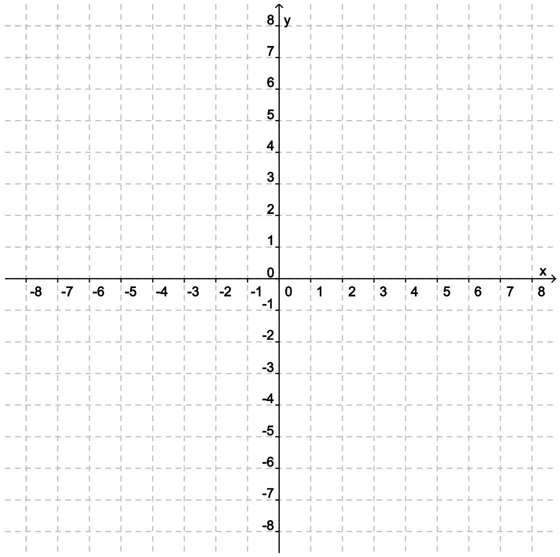
4. Graph $f(x) = \frac{1}{2} \cdot 3^{x+2} - 1$. State the domain, range, and asymptote. Be sure to describe the transformations to the basic function.



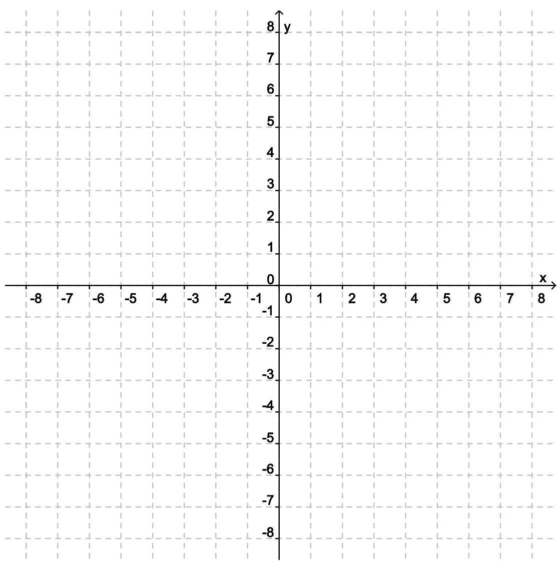
5. Graph $f(x) = 2 - e^{2x-4}$. State the domain, range, and asymptote. Be sure to describe the transformations to the basic function.



6. Graph $f(x) = 2\log_4\left(\frac{1}{2}x + 1\right) - 1$. State the domain, range, and asymptote. Be sure to describe the transformations to the basic function.



7. Graph $f(x) = 3\ln(-2x + 1)$. State the domain, range, and asymptote. Be sure to describe the transformations to the basic function.



8. Find the domain of $f(x) = \ln\left(\frac{x-2}{x+1}\right) + \sqrt{2x+1}$. (**NC**)

9. Find the domain of $f(x) = \frac{(x+3)\sqrt{x}}{\log_2(x-1)}$. (**NC**)

10. Expand using the properties of logarithms: $\ln \frac{(2x+1)\sqrt{x+2}}{5e^{-2}x^3(3-x)^4}$ (**NC**)

11. Expand using the properties of logarithms: $\log_2 \sqrt[3]{\frac{2^x(x-5)^3}{8\sqrt{x}(3x+7)^5}}$ (**NC**)

12. Write as a single logarithm and simplify: $2\log_4(x+1) - \frac{1}{2}\log_4 x + \frac{1}{3}\log_4(x-3) - 3\log_4(x+1)$ (**NC**)

13. Write as a single logarithm and simplify: $2\ln(2x-1) - \ln x + 3\ln\left(\frac{x+5}{2x-1}\right)$ (**NC**)

14. Solve: $3^{x+2} = 5^{2x-3}$

15. Solve: $3x^2 \cdot (-e^{-x}) + e^{-x} \cdot (6x) = 0$

16. Solve: $2 \cdot 3^{2x} + 5 \cdot 3^{x} - 3 = 0$

17. Solve: $\log_3 x + \log_3(x-1) = 2 + \log_3(x-2)$

18. Solve: $4 + \log_2(x - 1) = \log_2 x$

19. Solve: $2\log_3 x = \log_3 4 + \log_3(3 - x)$

20. Suppose there are 100 people on Mars in the year 2050, and that the population on the planet triples every 40 years. In what year will the population on Mars be one million people? (Use the exponential growth model $N(t) = N_0 e^{kt}$, and round the growth constant k to 5 significant figures.)

21. A yam is $325°F$ when you take it out of the oven. Twenty minutes later, the yam is $200°F$. Suppose the room temperature is $70°F$. First, use Newton's Law of Cooling to find a function that models the temperature of the yam t minutes after your initial temperature reading. Then, use the function to predict when the yam will be $150°F$. When solving, round k to 5 significant figures.

22. Find the exact value without a calculator. (**NC**)

a) $\sin\frac{5\pi}{3}$

b) $\cos(-135°)$

c) $\tan\frac{7\pi}{2}$

d) $\csc\frac{5\pi}{6}$

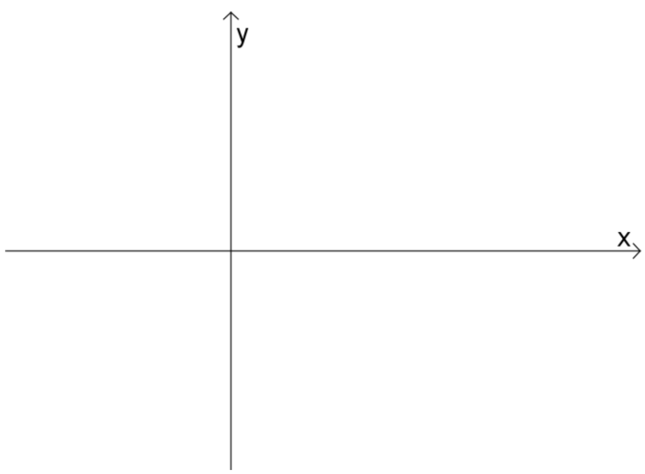
e) $\sec\frac{7\pi}{6}$

f) $\cot 660°$

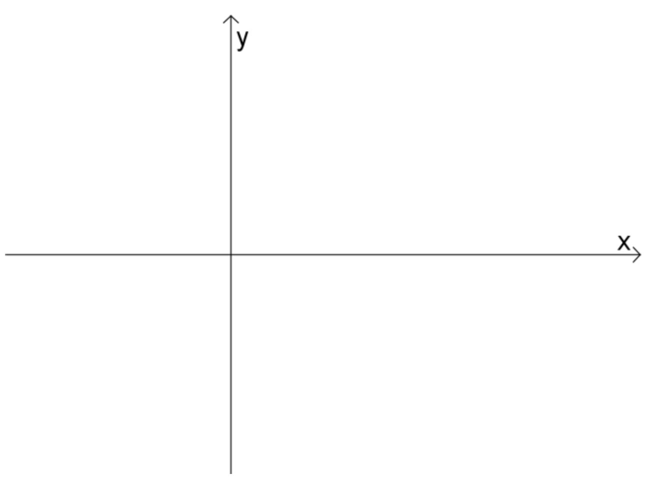
g) $\sin 2001\pi$

h) $\cos\left(-\frac{5\pi}{2}\right)$

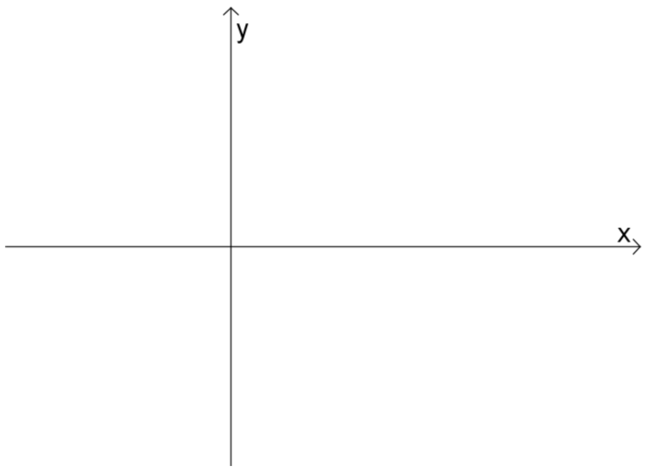
23. Find the amplitude, period, and phase shift of $y = 3\sin\frac{1}{2}\left(x - \frac{\pi}{2}\right) - 2$ and graph one complete period. Be sure to find the 5 key points.



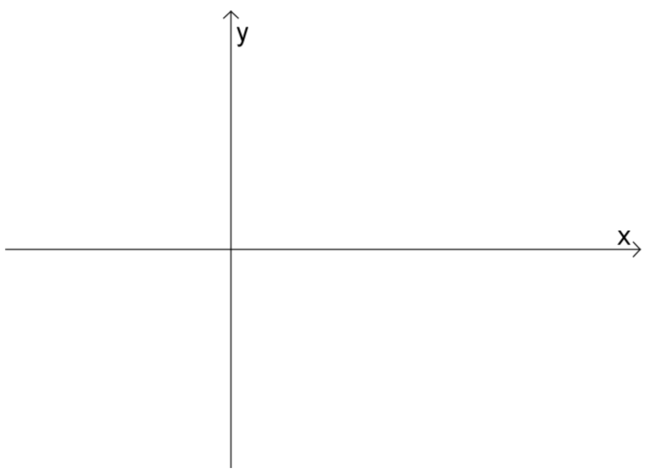
24. Find the amplitude, period, and phase shift of $y = 2 - \cos(2x + \pi)$ and graph one complete period. Be sure to find the 5 key points.



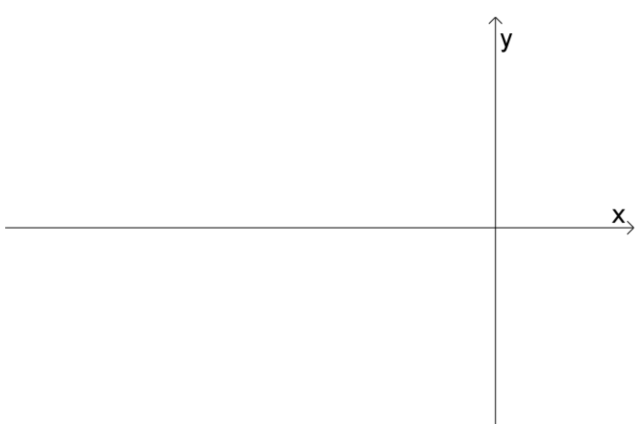
25. Find the period and phase shift of $y = 5\csc\left(\frac{1}{3}x - 2\pi\right)$ and graph one complete period. Be sure to find the 5 key points/asymptotes.



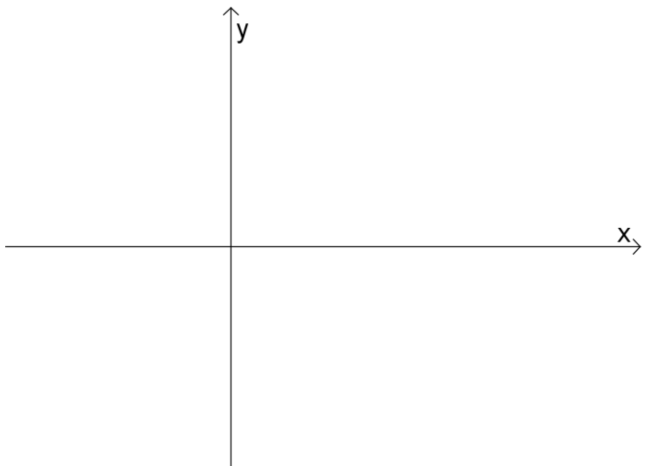
26. Find the period and phase shift of $y = -2\sec\frac{\pi}{2}(x-1) + 1$ and graph one complete period. Be sure to find the 5 key points/asymptotes.



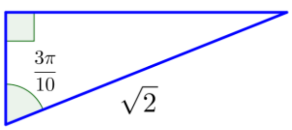
27. Find the period and phase shift of $y = 3\tan\left(\frac{x}{2} + \frac{\pi}{3}\right) - 2$ and graph one complete period. Be sure to find the 5 key points/asymptotes.



28. Find the period and phase shift of $y = \cot\left(2x - \frac{\pi}{3}\right) + 3$ and graph one complete period. Be sure to find the 5 key points/asymptotes.



29. Solve the following right triangle.



30. Suppose $\cot\theta = -\sqrt{5}$ and $\cos\theta > 0$. Find $\sin\theta$. (**NC**)

31. Suppose $\sin\theta = -\frac{1}{3}$ and $\sec\theta < 0$. Find $\tan\theta$. (**NC**)

32. Find the exact value in radians <u>without a calculator</u>. (**NC**)

a) $\sin^{-1}\frac{\sqrt{3}}{2}$

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

c) $\tan^{-1}(-\sqrt{3})$

d) $\sin^{-1}\frac{2}{\sqrt{3}}$

e) $\sec^{-1}(-2)$ (make sure your output is between 0 and π)

f) $\cos^{-1}(-1)$

g) $\tan^{-1} 0$

h) $\csc^{-1}\frac{2}{\sqrt{3}}$ (make sure your output is between $-\frac{\pi}{2}$ and $\frac{\pi}{2}$)

i) $\cot^{-1}(-1)$ (make sure your output is between 0 and π)

j) $\cos^{-1}\left(\cos\frac{4\pi}{3}\right)$

k) $\tan^{-1}\left(\tan\frac{7\pi}{6}\right)$

33. Find the exact value <u>without a calculator</u>. (**NC**)

a) $\cot\left(\cos^{-1}\left(-\frac{\sqrt{5}}{3}\right)\right)$

b) $\csc(\tan^{-1} 2)$

c) $\tan\left(\sin^{-1}\left(-\frac{2}{\sqrt{7}}\right)\right)$

34. Rewrite each expression as an algebraic expression in x. (**NC**)

a) $\cot(\sin^{-1} x)$

b) $\csc(\cos^{-1} x)$

35. Prove the identity: $\frac{\cos x}{1-\sin x} = \sec x + \tan x$ (**NC**)

36. Prove the identity: $\frac{1+\tan x}{1-\tan x} = \frac{\cos x+\sin x}{\cos x-\sin x}$ (**NC**)

37. Prove the identity: $\frac{1+\cos\alpha}{\sin\alpha}+\frac{\sin\alpha}{1+\cos\alpha}=2\csc\alpha$ (**NC**)

38. Prove the identity: $\frac{1}{\csc\theta+\cot\theta}=\csc\theta-\cot\theta$ (**NC**)

39. Prove the identity: $\tan^2 x - \sin^2 x = \tan^2 x \sin^2 x$ (**NC**)

40. Prove the identity: $\frac{\sin(x+y)}{\cos(x-y)} = \frac{\tan x + \tan y}{1 + \tan x \tan y}$ (**NC**)

41. Prove the identity: $2\sin^2 2x + \cos 4x = 1$ (**NC**)

42. Find the exact value of $\sin\left(\cos^{-1}\frac{4}{5} + \tan^{-1}\frac{3}{4}\right)$ <u>without a calculator</u>. (**NC**)

43. Find the exact value of $\cos\left(2\tan^{-1}\left(-\frac{3}{2}\right)\right)$ <u>without a calculator</u>. (**NC**)

44. Write $\cos(\tan^{-1} x - \sin^{-1} y)$ as an algebraic expression in x and y, where x is any real number and $-1 \leq y \leq 1$. (**NC**)

45. Write $\cot(2\cos^{-1} x)$ as an algebraic expression in x only, where $-1 \leq x \leq 1$. (**NC**)

46. Suppose $\tan x = 4$ and $180° < x < 270°$. Find $\cos 2x$, $\sin 2x$, and $\sin\frac{x}{2}$. (**NC**)

47. Suppose $\sec x = 3$ and $270° < x < 360°$. Find $\sin 2x$, $\tan 2x$, and $\cos\frac{x}{2}$. (**NC**)

48. Express $\cos^4 x$ in terms of the first power of cosine. (**NC**)