Practice Final

Math 3C: Precalculus

Instructor: David Lenz

Final: Monday December 9 at 8:00 AM in YORK 2622.
Bring your student ID. Do NOT bring a calculator or any formula sheets.

Problem 1 True or False. Write the word "True" or "False" next to each statement. You *do not* need to show your work for this question.

__________ The function $f(z) = 2|z|$ is even.

__________ If $t(a) = a$, then $t^{-1}(a) = \frac{1}{a}$.

__________ The arc spanned by a 270° angle on a circle of radius 2 is 2π units long.

__________ The range of $\cos^{-1}(y)$ is $[\frac{-\pi}{2}, \frac{\pi}{2}]$.

__________ The long-run behavior of $p(x) = 3x^2 - 4x - 5x^5 + 2$ is that $p(x) \to \infty$ as $x \to -\infty$ and $p(x) \to -\infty$ as $x \to \infty$.

__________ An angle that measures $\frac{7\pi}{4}$ radians is 270° when measured in degrees.

__________ The function $k(b) = \frac{b}{b^2-1}$ has no horizontal asymptotes.

__________ The line passing through the points $(2, 4)$ and $(7, 8)$ has a slope of $\frac{4}{5}$.

__________ $\sin(3x)$ is an odd function.

__________ $g(y) = 2y^4$ is not one-to-one.

__________ The circle centered at $(1, -1)$ with radius 4 is described by the equation $(x + 1)^2 + (x - 1)^2 = 16$.

Problem 2 True or False. Write the word "True" or "False" next to each statement. You *do not* need to show your work for this question.

__________ A bank account with \$1000 and an annual interest rate of 4% will generate more money if interest is compounded monthly than if interest is compounded daily.

__________ For some numbers a, b, and c, with $a, b > 0$, $\log_b(a^c) = \log_b(a) + c$.

__________ The number e is less than 3.

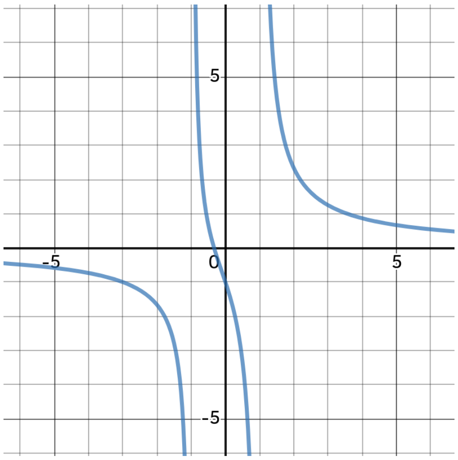
__________ If $a(x) = 3x$ and $b(x) = e^x + x$, then $(b \circ a)(x) = e^{3x} + x$.

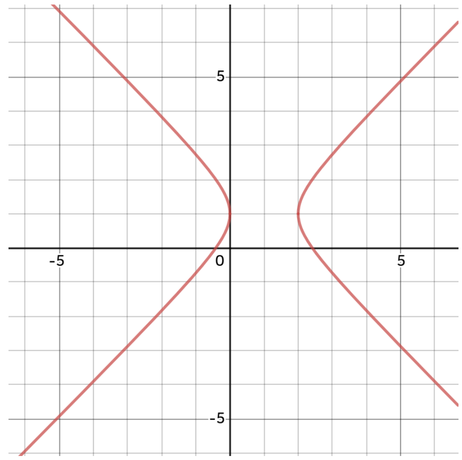
__________ The total number of students enrolled at UCSD is a function of the year.

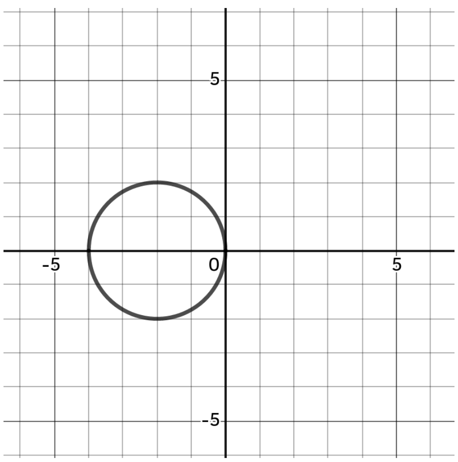
Problem 3 Solve the equation $3|2 + 4x| = 12$ for x.

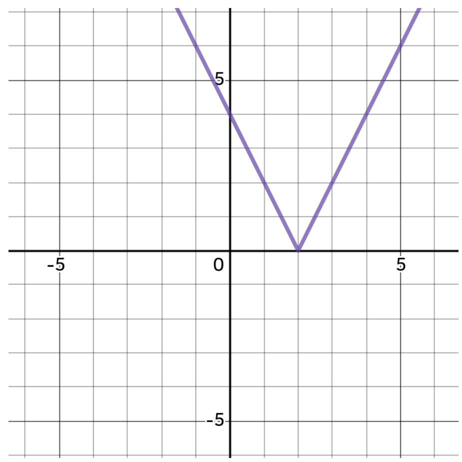
Problem 4 Find the points where the circle described by $x^2+(y-3)^2 = 15$ intersects the line $y = 2x + 3$. Write your answer as a coordinate pair(s); your answer may involve radicals that can't be simplified.

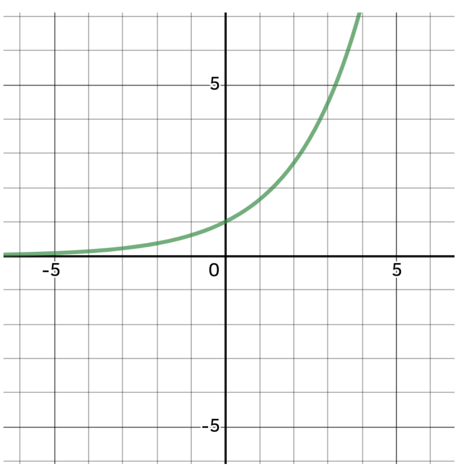
Problem 5 Which of the following graphs represent functions? Circle all that apply.

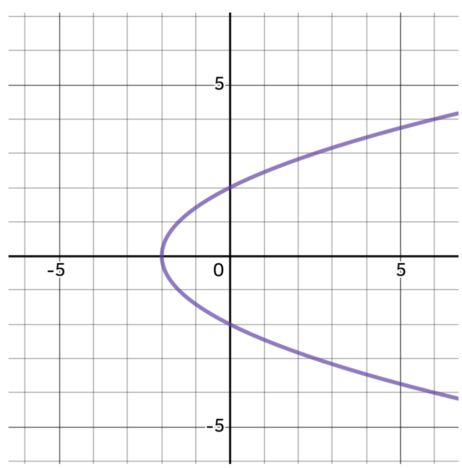




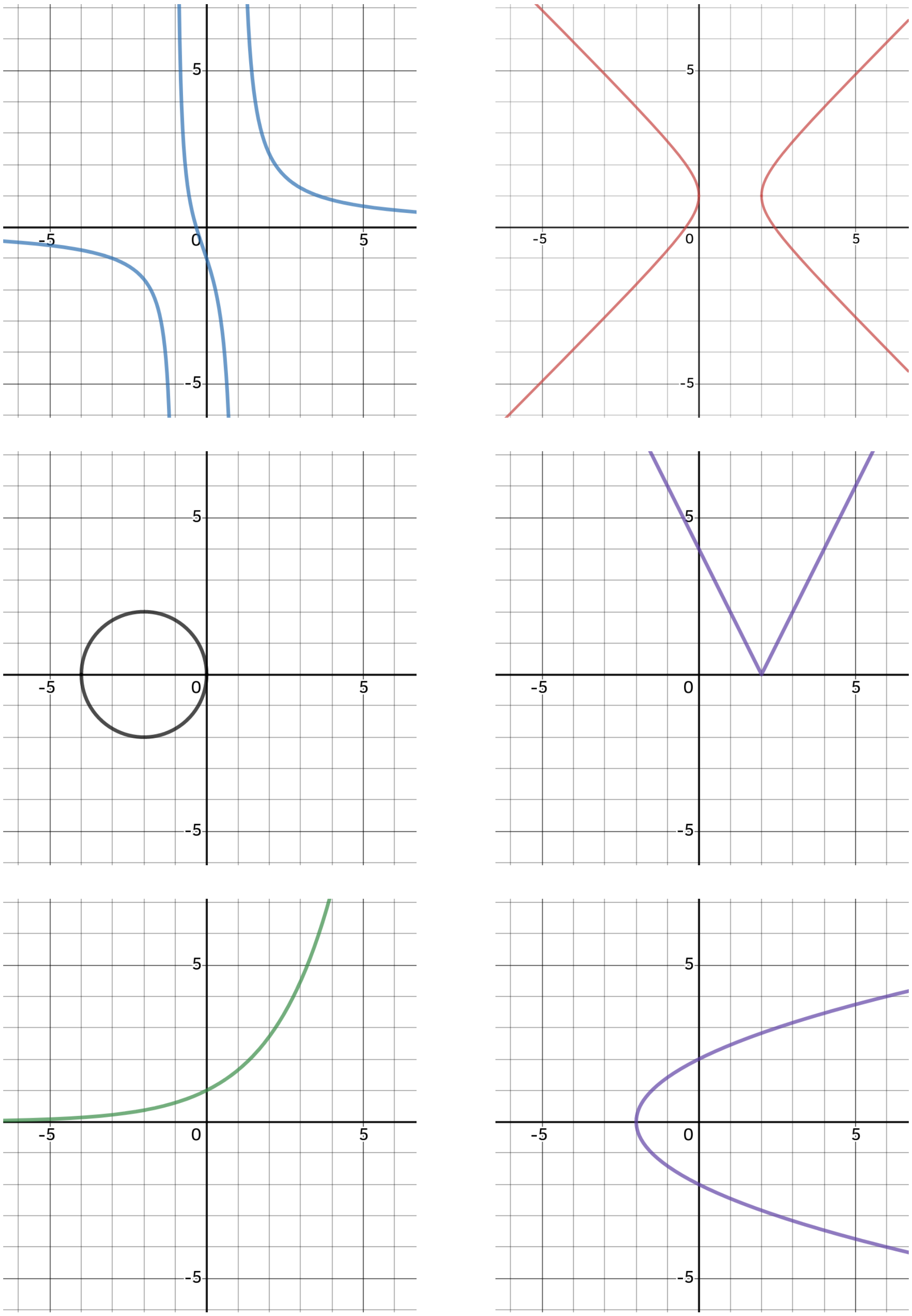








Problem 6 Which of the following graphs represent **one-to-one** functions? Circle all that apply.



Problem 7 What are the coordinates of the point on a circle (centered at the origin) of radius 5 at an angle of $\theta = \frac{5\pi}{3}$ radians?

What is another angle where the corresponding point has the same x-coordinate as the point above?

Compute the following:
$\tan(\theta)$

$\csc(\theta)$

$\sec(\theta)$

Problem 8 Let $p(x) = -2x(x-3)^2$.

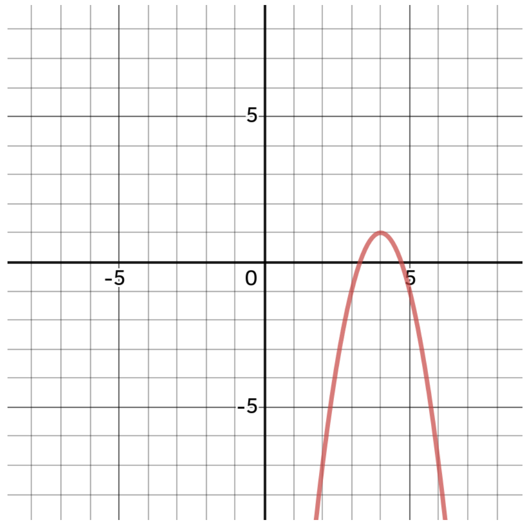
What is the long-run behavior of $p(x)$?

What is the **vertical** intercept of $p(x)$?

What are the **horizontal** intercepts(s) of $p(x)$, and what are their multiplicites?

Sketch a graph of $p(x)$. Use descriptive tick marks and label all intercepts.

Problem 9 Which of the following formulas could represent the parabola shown in the diagram?



(a) $f(x) = -(x+4)^2 - 1$

(b) $g(x) = (x+1)^2 - 4$

(c) $h(x) = -2(x-4)^2 + 1$

(d) $k(x) = 3(x-4)^2 + 1$

(e) $l(x) = -4(x-1)^2 + 4$

Problem 10 Solve the equation $2 \cdot 5^{y-4} = 14$ for y. Your answer may have exponentials or logarithms that cannot be simplified.

Problem 11 Is the function $q(y) = -2 \cdot (0.5)^y$ increasing or decreasing?

Problem 12 What is the domain and range of $h(t) = \sqrt{t}$?

Let $r(t) = 2\sqrt{3 - t} + 4$. $r(t)$ can be obtained from $h(t)$ through a series of four transformations. What are these transformations?

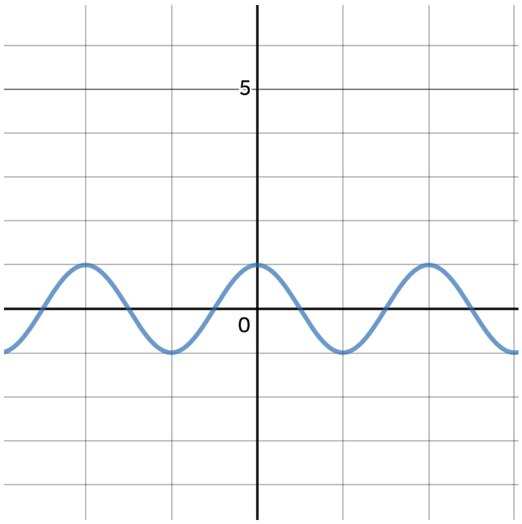
What are the domain and range of $r(t)$?

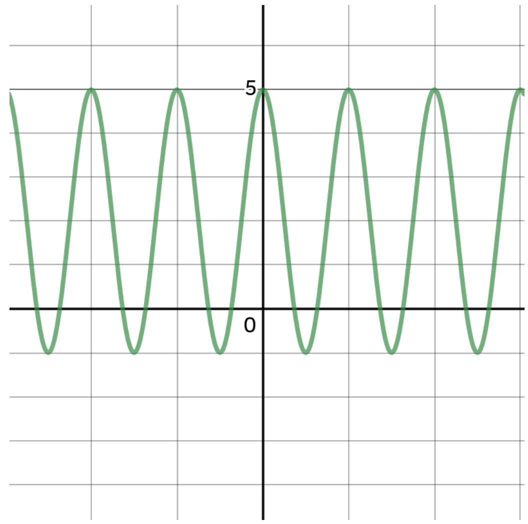
Sketch $r(t)$ and $h(t)$ on the same set of axes. Your sketch doesn't need to be exact but should reflect the transformations described above.

Problem 13 Find the point where the two lines $u(x) = 3x + 1$ and $v(x) = 6x - 2$ intersect. Write your answer as a coordinate pair.

Consider two new lines: $f(c) = 2c - 5$ and $g(c) = \frac{1}{2}c + 3$. Are the lines $f(c)$ and $g(c)$ perpendicular? Why or why not?

Problem 14 Consider the two graphs below.





To transform the left graph into the right graph, the amplitude has been tripled, the period has shrunk by a factor of two, and the graph has been shifted up by 2 units.

The formula for the graph on the left is $\cos(\pi \cdot x)$. Determine the formula for the graph on the right.

Problem 15 Find the zeros of the function $y(a) = \frac{2(a-12)(a-3)(a+4)}{(a+3)(a-3)}$.

Problem 16 Let $g(s) = \ln(s+2)$ and $h(s) = e^s$. Compute and simplify $(h \circ g)(3)$.

Problem 17 Use trigonometric identities to simplify the following expressions:

$(1 - \cos^2(x))\csc(x)$

$\frac{1}{2\csc(x)sec(x)}$

$\sec(x)(\cos(x) + \tan(x)\sin(x))$

Problem 18 Using the fact that $4^{1.5} = 8$, simplify the following expression.

$$\frac{2\log_4(6) + \log_4(2) - \log_4(9)}{\log_4(16)}$$