

Math 1: Calculus with Algebra

Sample Exam Questions

Problem 1: Expand and simplify $(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b})$.

Problem 2: Simplify without negative exponents $(2a^{-3}b^2)(-1ab^{-2})^{-3}$.

Problem 3: Simplify the expression $\frac{x^2}{x^2} - \frac{x+1}{x+2}$.

Problem 4: Find the equation of the line that passes through the points $(-1, 3)$ and $(4, 17)$.

Problem 5: Let $f(x) = 2x - 4$. Evaluate and simplify

$$\frac{f(1+h) - f(1)}{h}.$$

Problem 6: Find the domain and range of the function $f(t) = \sqrt[3]{t+11} - 8$.

Problem 7: Explain what a function is. Explain what a 1-1 function is.

Problem 8: Graph the function $f(x) = \ln(x)$. Write the equations for the graphs that are obtained from the graph of $\ln(x)$ as follows:

1. Shift 3 units to the right
2. Compress vertically by a factor of 2
3. Reflects about the x -axis.

Problem 9: Suppose a ball is dropped from a building and the distance travelled by the ball is given by $d(t) = 10t^2$. Showing several average velocity calculations, estimate the instantaneous velocity at the time $t = 4$.

Problem 10: Let $f(x) = \frac{x-1}{3x+11}$. Find $f^{-1}(x)$.

Problem 11: If $f(x) = 2x - 1$ and $g(x) = e^{-11x}$, find $f \circ g$ and $g \circ f$.

Problem 12: Sketch the graph of

a) $f(x) = x^2$

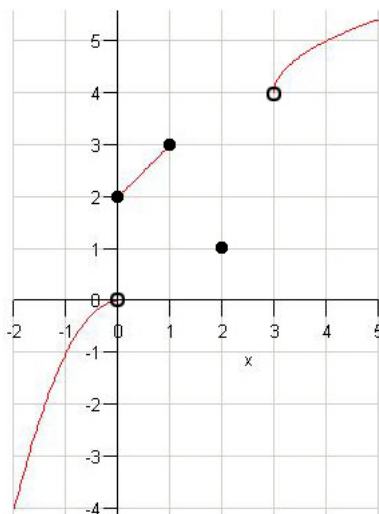
b) $f(x) = e^x$

c) $f(x) = \sin(x)$

d) $f(x) = 1 + 2 \cos(x)$

e) $f(x) = \sqrt{-2x + 1}$

Problem 13: If f is given by

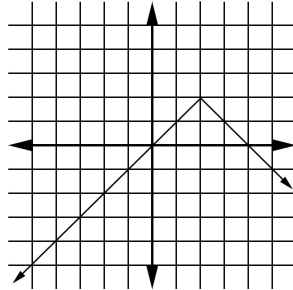


does f have an inverse? Why or why not?

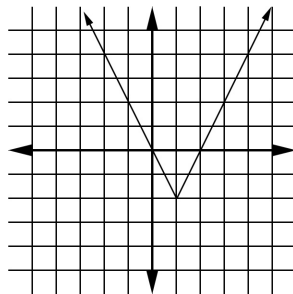
Problem 14: Solve the equation $\ln(x - 11) = \frac{2}{3}$.

Problem 15: Write as a single logarithm: $3 \log_2(4) - \log_2(3) + 2 \log_2(5)$.

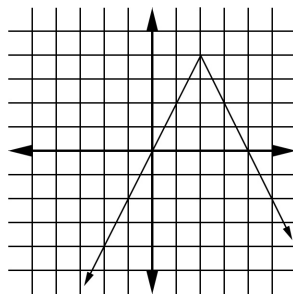
Problem 16: Let f be the graph below.



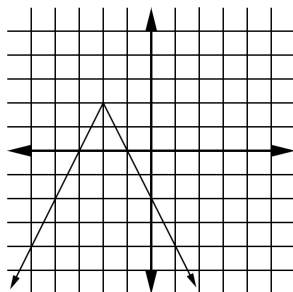
Write the equation of the graph represented by
a)



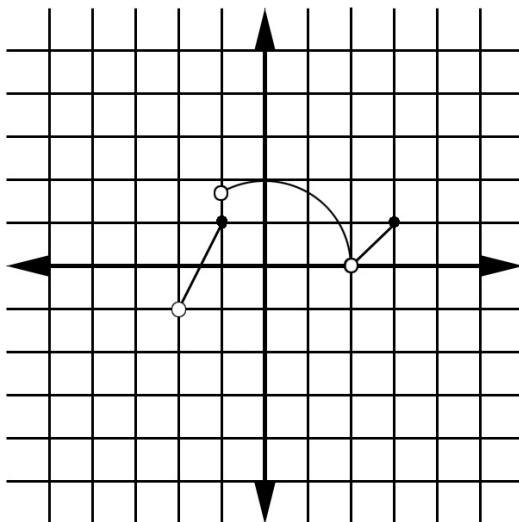
b)



c)



Problem 17: Consider the graph f given by



Find

a) $f(3)$

b) $f(-2)$

c) $\lim_{x \rightarrow -1^+} f(x)$

d) $\lim_{x \rightarrow -1^-} f(x)$

e) $\lim_{x \rightarrow -1} f(x)$

f) $\lim_{x \rightarrow 2} f(x)$

Problem 18: Explain what the limit of a function is.

Problem 19: Find

a) $\lim_{x \rightarrow \infty} \ln(x)$.

b) $\lim_{x \rightarrow \infty} e^x$.

c) $\lim_{x \rightarrow -\infty} e^x$.

d) $\lim_{x \rightarrow -\infty} \frac{x^2}{x}$.

e) $\lim_{x \rightarrow 5} \sqrt{x-1}$.

Problem 20: If $f(x) = \frac{12}{x+2} - 8$, find

a) $f(0)$

b) $f(1)$

c) $f(-4)$

d) $f^{-1}(-8)$

e) $f^{-1}(4)$

Problem 21: What are the vertical asymptotes of $f(x) = \tan(x)$?

Problem 22: Let $f(x) = x^2 - 6x + 9$. Write down the equation that describes the graph which results after starting with $f(x)$ and reflecting it about the x -axis, shifting it 2 units up, shifting it 3 units left, stretching vertically by a factor of 2, and reflecting about the y -axis in that order.

List of functions to know how to graph:

a) x^n for n positive and negative integers

b) $\sqrt{x}, \sqrt[3]{x}$

c) $\sin(x), \cos(x), \tan(x), \cot(x)$

e) exponential functions and logarithmic functions