

1. [10] TRUE/FASLE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f & g , be functions, and x & y be real numbers not equal to zero.

T F $\frac{2x+1}{2y} = \frac{x+1}{y}$

T F All functions pass the vertical line test

T F The lines described by $y = -\frac{1}{3}x + 1$, and $\frac{1}{3}y - 2 = x$ are perpendicular.

T F The vertex of $f(x) = -x^2 + 2$, is at the point $(0, 2)$.

T F $(f+g)(x) = f(x) + g(x)$

T F $f(x+y) = f(x) + f(y)$

T F Let $v, w > 0$, then $\log v + \log w = \log(v+w)$

T F Let v & w be real numbers, then $\sin v + \sin w = \sin(v+w)$

T F $y^{\frac{1}{2}} = y^{-2}$

T F $\tan x + \cot x = \sec x \csc x$

Correct answers will *not* get credit without supporting work. Note that “undefined” and “no solution” are possible answers.

2. [4] (Practice Exam #1) Solve for x .

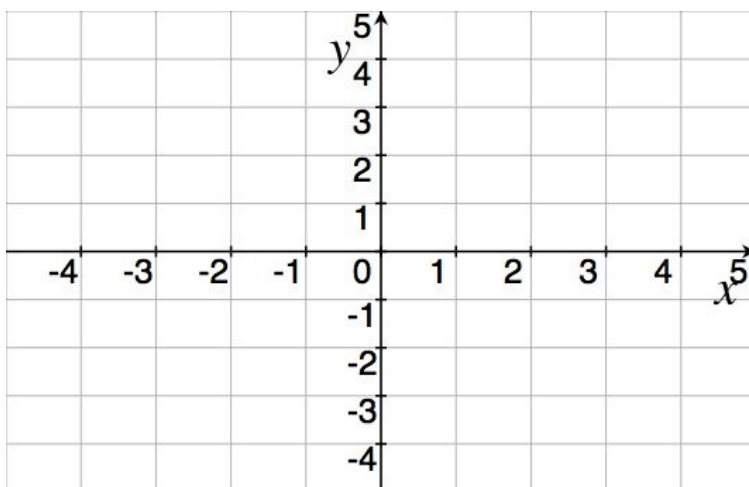
$$x(5+x^2)^{-\frac{1}{2}} = 1$$

3. [4] Draw the graph of a function h that satisfies the following:

(a) h is a polynomial function

(b) -1 and 3 are roots of h

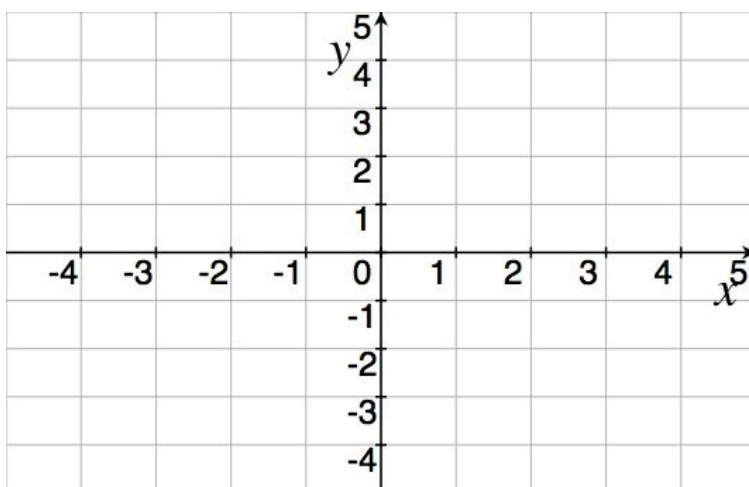
(c) $h(x) \rightarrow \infty$ as $x \rightarrow \infty$



4. (Practice Exam #3) Let $f(x) = x^{-1}$, and $g(x) = \sqrt{x+2}$,

(a) [2] Carefully graph g .

(b) [1] (§1.2 #19) Find the domain of g .

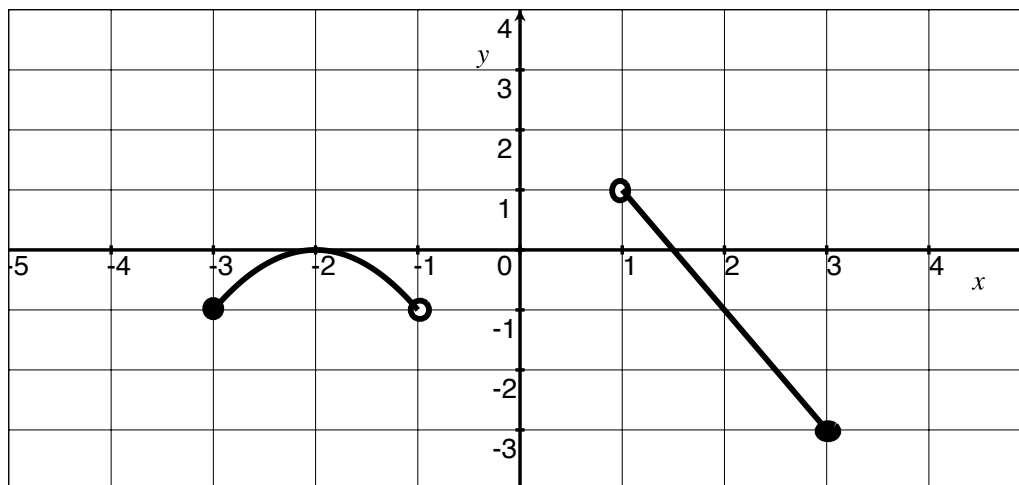


(c) [1] (§1.2) Find the range of g .

(d) [1] (§1.4) Find the rule of $(f \circ g)(x)$.

(e) [2] (§1.4) Find the domain of $(f \circ g)(x)$.

5. (Practice Exam #4 & 5) Let the following be the complete graph of f .



(a) [5] The function f is a piecewise defined function consisting of a straight line and a portion of a parabola. Write down the rule for f .

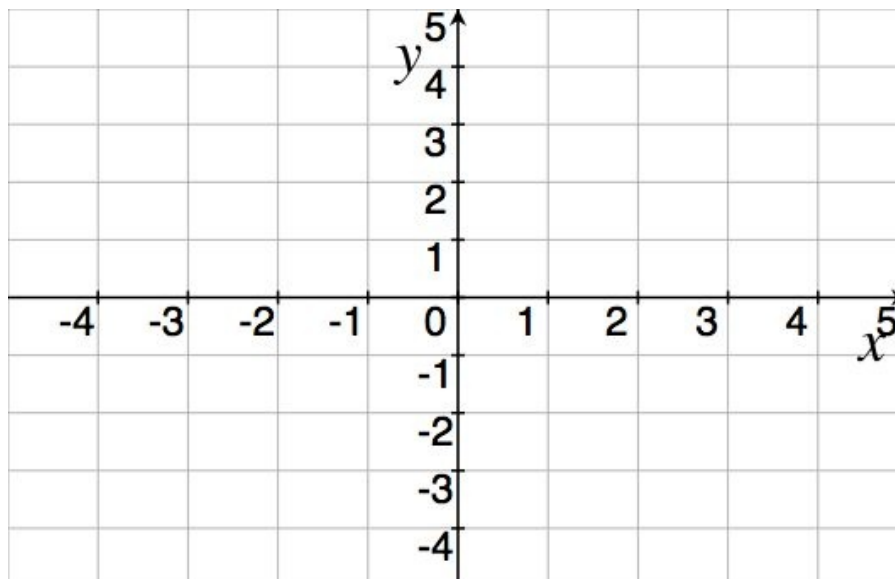
(b) [3] (§1.2) Estimate the following *if* possible:

$$f(-3)$$

$$f(-3) + f(3)$$

(c) [2] (§1.2) Find the x value(s) so that $f(x) = -1$?

6. (Midterm2 #3) Let $A = (-3, 2)$, $B = (1, 4)$, and $C(-1, 0)$.



- (a) [1] Plot the point A , B and C on the above graph.
- (b) [2] (WebHW10 #4) Find the distance between B and C .
- (c) [4] (WebHW10 #10) Find the equation of a circle centered at C that passes through B .
- (d) [3] (§4.2 #13) Find the area of the region in the xy -plane under the line segment that connects A and B but is also above the x -axis.

7. [6] For each of the functions f below, find a formula for the inverse, f^{-1} if it exists.

$$f(x) = \frac{1}{x+2}$$

$$f(x) = 2^{x+1}$$

8. [8] (§3.3) Find all values x that satisfy the following (be sure to check your answers):

$$2 \log_4(5x+1) = 2$$

$$5^{4x-1} = 7^x$$

9. [6] Simplify:

(WebHW6 #8) $\frac{(c^{\frac{1}{2}})^3 \sqrt[3]{d^3}}{(\sqrt[4]{c}(d^{-\frac{1}{4}}))^3}$

(WebHW14 #9) $\sin^{-1}\left(\sin \frac{7\pi}{6}\right)$

10. [4] (§5.4 #6) Let $\frac{\pi}{2} < \theta < \pi$ and $\sin \theta = \frac{3}{4}$. Find $\tan \theta$.

11. [6] (§6.4 #14) Let $\frac{\pi}{2} < \theta < \pi$ and $-\frac{\pi}{2} < \phi < 0$. Given that $\sin \theta = \frac{3}{4}$ and that $\cos \phi = \frac{1}{5}$, find $\cos(\theta + \phi)$. (You are free to use results from #9 above.)

12. [5] (Midterm 2 #8) You are shopping for a home loan to buy a modest \$120,000 home and would like a fixed interest rate since you've heard how variable rates have treated other home owners.

A Credit Union approves your request for \$96,000 with 4.5% effective annual interest on a 25 year loan. You will have to pay the 20% down payment of \$24,000 out of pocket.

A bank offers you a 20 year loan for \$80,000 with an effective annual interest rate of 4.5% *and* a second loan to act as a down payment. The second loan is a 10 year loan for \$40,000 has an effective interest rate of 15%.

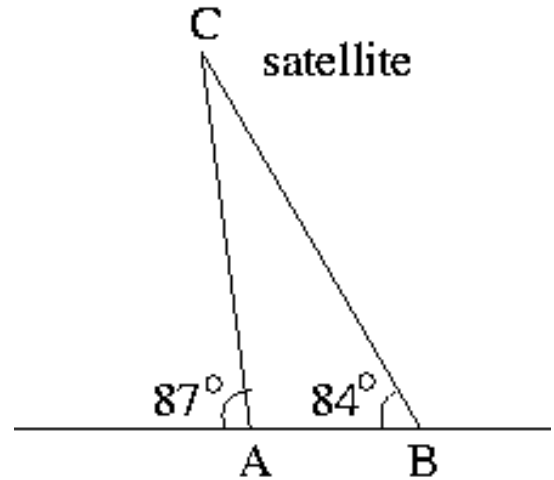
Which deal will reduce your overall financial obligations? How much overall money would you save making your choice over the other?

13. [5] (§3.5 #15) The most intense recorded earthquake in Texas occurred in 1931; it had Richter magnitude 5.8. If an earthquake were to strike Texas next year that was three times more intense than the current record in Texas, what would its Richter magnitude be?

Recall that an earthquake with seismic waves of size S has Richter magnitude $\log \frac{S}{S_0}$, where S_0 is the size of the seismic waves corresponding to what has been declared to be an earthquake with Richter magnitude 0.

14. [5] (WebHW15 #6) The path of a satellite orbiting the earth causes it to pass directly over two tracking stations A and B, which are 45 miles apart. When the satellite is on one side of the two stations, the angles of elevation at A and B are measured to be 87 degrees and 84 degrees, respectively.

How far is the satellite from station A?



15. [5] (Lecture) A block is sliding down a frictionless ramp with an angle of inclination of 30° , how fast is the block accelerating down the ramp? Keep in mind that gravity is a force directed straight down and has a magnitude of $9.8 \frac{\text{m}}{\text{s}^2}$.

