

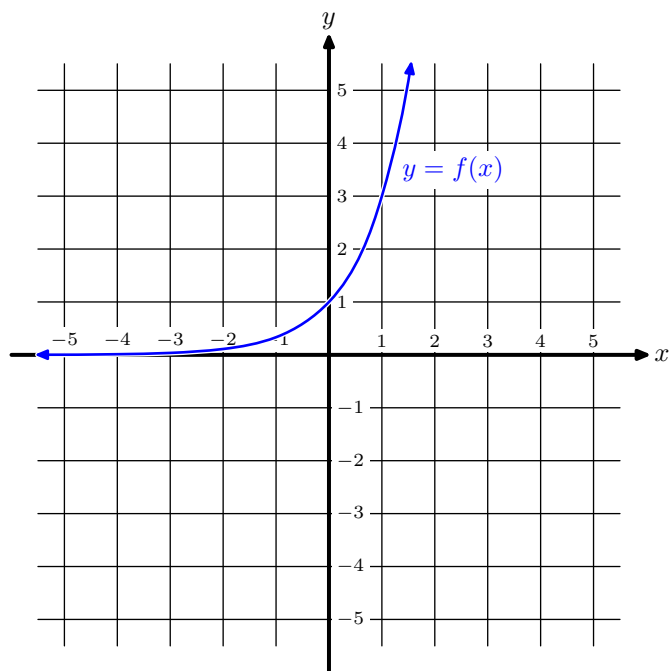
Math 103: College Algebra and Trigonometry
Exam 3 review answers

Answer 1. $f^{-1}(x) = \sqrt[3]{x-5}$

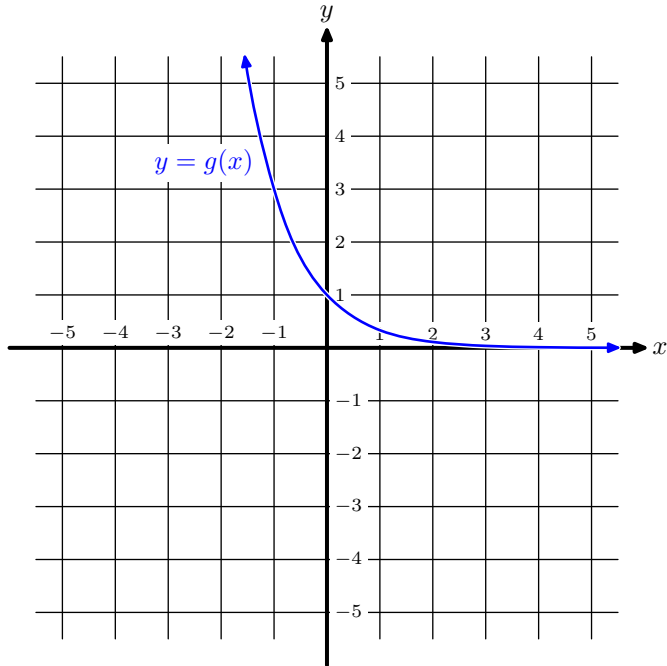
Check: $(f^{-1} \circ f)(x) = f^{-1}(f(x)) = f^{-1}(x^3 + 5) = \sqrt[3]{(x^3 + 5) - 5} = \sqrt[3]{x^3} = x$

Answer 2.

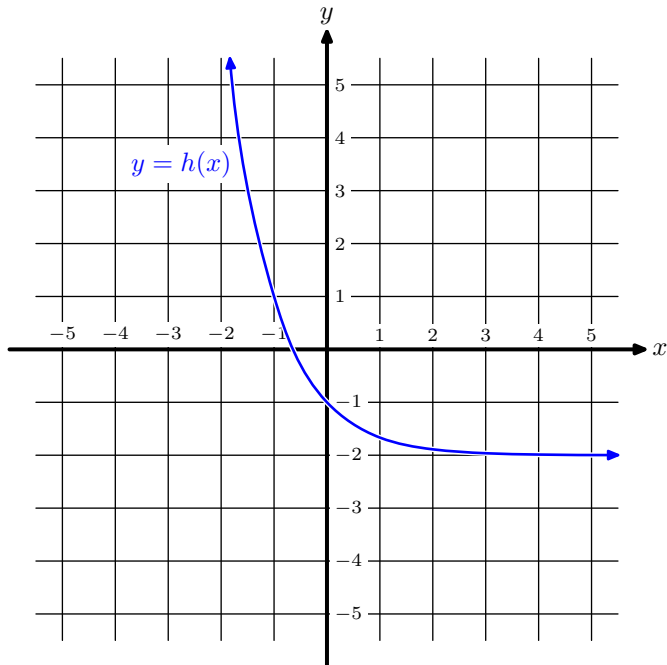
(a) The graph of $f(x)$ is shown below.



(b) The graph of $g(x)$, shown below, is the graph of $f(x)$ reflected about the y -axis.



(c) The graph of $h(x)$, shown below, is the graph of $g(x)$ shifted down 2 units.



Answer 3. $x = 3$ or $x = -6$

Answer 4. $(0, \infty)$

Answer 5. $(-\infty, -5) \cup (1, \infty)$

Answer 6. 2

Answer 7. $x = 1$. [$x = -5$ is “almost” a solution, but it’s not in the domain of $\log_2(x+1)$ or $\log_2(x+3)$.]

$$\text{Check: } \log_2(1+1) + \log_2(1+3) = \log_2 2 + \log_2 4 = 1 + 2 = 3.$$

Answer 8. 5.5 years

Answer 9. \$430.35

Answer 10. After 1 hour, there is about 10.24 mg of morphine in the patient’s bloodstream. The amount falls to 10% of the initial dose after about 9.63 hours.

Answer 11.

- (a) $k \approx -0.04141$
- (b) About 85.01 grams were produced in the reaction.
- (c) Find the answer yourself—look up the half-life of zirconium-97 (^{97}Zr) on the Internet. Try the Wikipedia article “Isotopes of zirconium.” Your answer might be very slightly off because I rounded the numbers 78.25 and 72.03 in the original problem.

Answer 12.

- (a) $\frac{5\pi}{4}$
- (b) -105°

Answer 13. There was a typo in the original problem. Things work out more nicely if $\tan \theta = \frac{15}{8}$ rather than $\tan \theta = \frac{17}{8}$.

With $\tan \theta = \frac{15}{8}$:

$$\begin{aligned} \sin \theta &= \frac{15}{17}, & \cos \theta &= \frac{8}{17}, & \tan \theta &= \frac{15}{8}, \\ \csc \theta &= \frac{17}{15}, & \sec \theta &= \frac{17}{8}, & \cot \theta &= \frac{8}{15}. \end{aligned}$$

With $\tan \theta = \frac{17}{8}$:

$$\begin{aligned} \sin \theta &= \frac{17}{\sqrt{353}} = \frac{17\sqrt{353}}{353}, & \cos \theta &= \frac{8}{\sqrt{353}} = \frac{8\sqrt{353}}{353}, & \tan \theta &= \frac{17}{8}, \\ \csc \theta &= \frac{\sqrt{353}}{17}, & \sec \theta &= \frac{\sqrt{353}}{8}, & \cot \theta &= \frac{8}{17}. \end{aligned}$$

Answer 14. 1

Answer 15. There was a typo in the original problem. I meant to have $\sin \frac{\pi}{6} + \cos^2 \frac{\pi}{4}$.

$$\sin \frac{\pi}{6} + \cos^2 \frac{\pi}{4} = \frac{1}{2} + \left(\frac{\sqrt{2}}{2}\right)^2 = \frac{1}{2} + \frac{1}{2} = 1.$$

$$\sin \frac{\pi}{6} + \cos \frac{\pi}{4} = \frac{1}{2} + \frac{\sqrt{2}}{2} = \frac{1 + \sqrt{2}}{2}.$$

Answer 16. To the nearest yard, the fencepost is 325 yards from the tree, and the surveyor is 485 yards from the fencepost.