Math 261 – Lab 1 **Algebra Review** Name_____

1. Evaluate each of the following.

   (a) $(-3)^2$ (b) -3^2 (c) $\sqrt[3]{-27}$ (d) $\dfrac{\sqrt{50}}{\sqrt{2}}$

2. Find an equation for a line meeting each description.

   (a) The line that passes through the points (4, –3) and (2, 1)

   (b) The line with the same x-intercept as $x - 2y = 4$ and which is parallel to the line that passes through the points (4, –2) and (–3, 1)

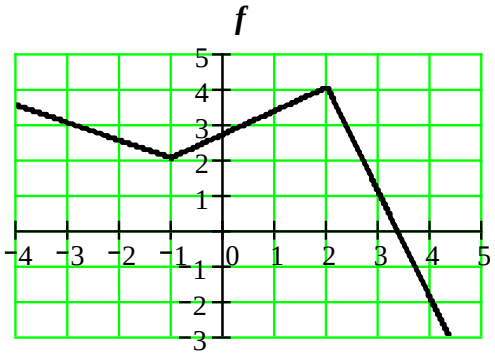
3. Given the graphs of functions f and g as defined below:

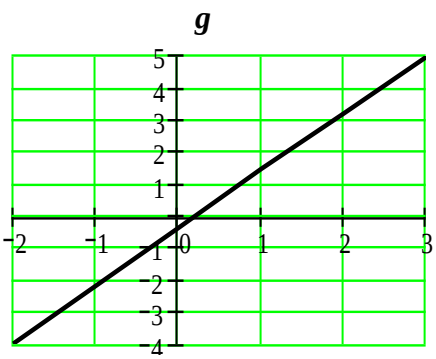
   (a) Find the equation of the segment that passes through $g(1)$.

   (b) Find the equation of the segment that passes through $f(1)$.

   (c) Approximate the domain and range for f and g.

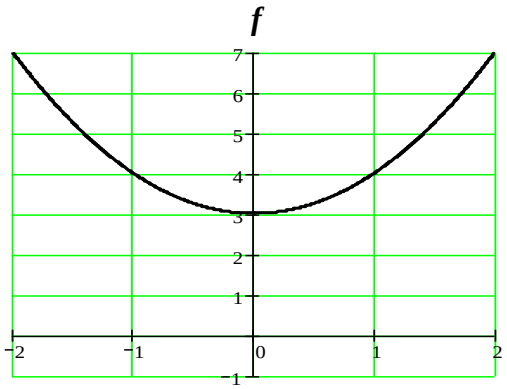
   (d) Determine the exact value of $(f \circ g)(1)$.

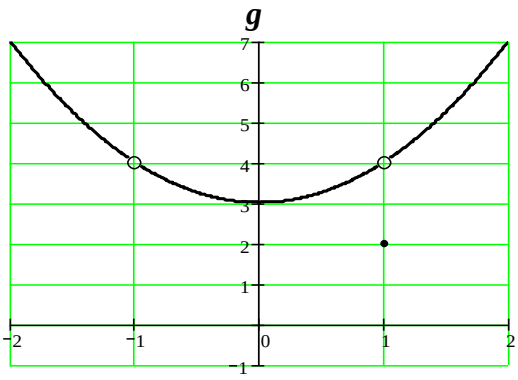




4. For the functions f and g defined by the graphs below, compute

$f(-1)$ $f(0)$ $f(1)$ $g(-1)$ $g(0)$ $g(1)$





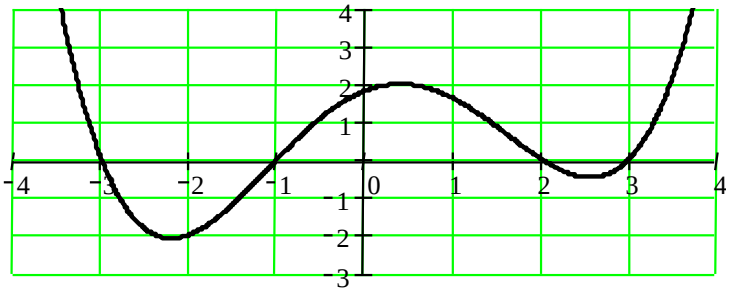
5. For the function f defined by the graph below: *(Assume only the visible graph.)*

(a) Determine the values of x when $f(x) < 0$.

(b) Approximate the value(s) of x when $f(x) = 1$.

(c) Approximate the domain and range of f. *(Assume only the visible graph.)*

(d) Approximate the intervals where f is decreasing. *(Assume only the visible graph.)*



6. Simplify each of the following. The answers must have no negative exponents and be factored completely.

(a) $\dfrac{\dfrac{1}{t+h+1}-\dfrac{1}{t+1}}{h}$

(b) $\dfrac{\frac{2}{3}(x-1)^{-\frac{1}{3}}(x+2)^2-2(x-1)^{\frac{2}{3}}(x+2)}{\left[(x+2)^2\right]^2}$

7. The water level of a rectangular aquarium as a function of time is plotted on the following coordinate plane. When the faucet for filling the aquarium is on, the water level rises at a steady rate. Similarly, when the drain plug is pulled out, the water level falls at a steady rate (but slower than the faucet's rate). At various times some other events occur that affect the water level or the rate at which the water level changes. Identify the point in time when each of the following events ***first*** occurs.

(a) Pull the plug out when the faucet is off.

(b) Pull the plug out when the faucet is on.

(c) Put the plug in when the faucet is on.

(d) Dump a bucket of water into the aquarium.

(e) Turn the faucet off when the plug is in.

(f) Pull a large rock out of the aquarium.

(g) Put the plug in when the faucet is off.

(h) Turn the faucet on when the plug is in.

(i) Turn the faucet on when the plug is out.

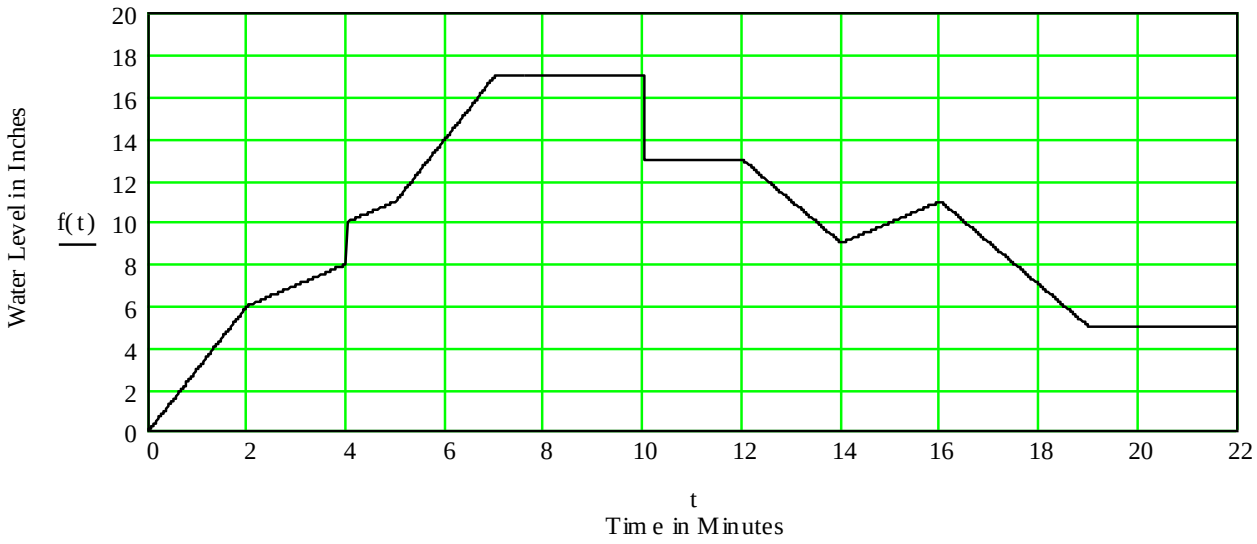
(j) Turn the faucet off when the plug is out.

(k) Find the rate at which the water depth changes when the faucet is on and the plug is in.

(l) Find the rate at which the water depth changes when the faucet is off and the plug is out.

(m) What is the depth of the water at the end of 3 minutes? 11 minutes? and 17 minutes?

(n) Write an equation for the line segment over the time interval from 16 to 19 minutes.



8. Let $f(x)=\sqrt{x}$. Find and simplify the following.

(a) $f(18)$

(b) $f\left(\frac{4}{5}\right)$

(c) $\frac{f(a+h)-f(a)}{h}, h\neq 0$

Hint: Rationalize the numerator.

9. Find the domain for each of the following functions. Express each domain in interval notation.

(a) $g(x)=(3x^2-2x)\sqrt{6-7x}$

(b) $s(t)=\frac{3t-2}{2t^2-t-6}$

10. Solve each of the following inequalities. Express each solution in interval notation.

(a) $|3-2x|\leq 5$

(b) $3(2x-5)-(x+6)\geq -3(x-2)$

(c) $x^3+5x^2>6x$

(d) $-4x(1-3x)-12x^2\geq 3$

(e) $\dfrac{x+1}{x^2-5x+6} \geq 0$

(f) $\dfrac{2x}{2x-3} \leq \dfrac{x+2}{x+5}$

11. Given the function f defined by $f(x) = \dfrac{\frac{2}{3}(x-1)^{-\frac{1}{3}}(x+2)^2 - 2(x-1)^{\frac{2}{3}}(x+2)}{\left[(x+2)^2\right]^2}$.

(a) Evaluate $f(-7)$.

(b) Determine the domain of f.

(c) Solve $f(x) = 0$.

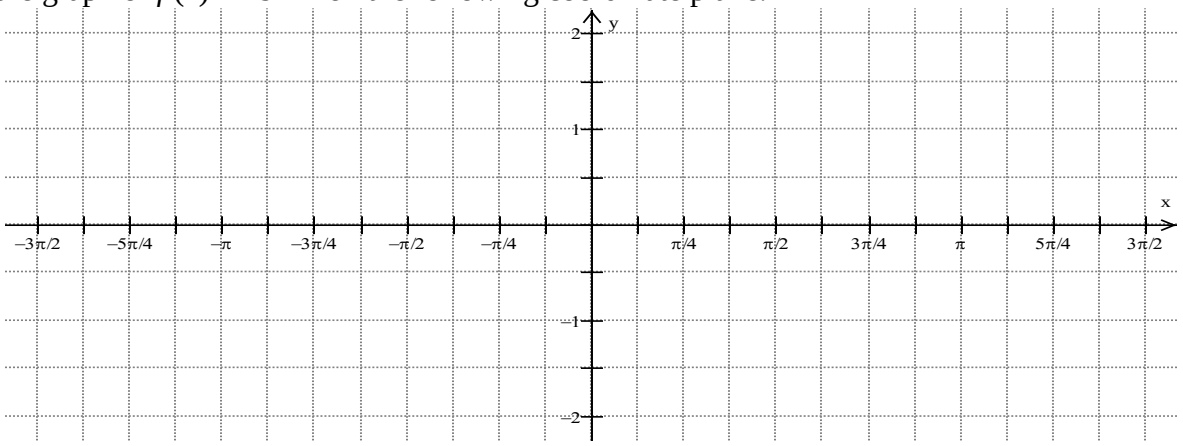
(d) Solve $f(x) > 0$.

12. Solve each of the following equations.

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

(b) $\sqrt{5-x}+1=x-2$

13. Plot the graph of $f(x) = 2\sin x$ on the following coordinate plane.



14. Find the exact value for each of the following.

(a) $\cot\left(\frac{4\pi}{3}\right)$

(b) $\sin\left(\frac{21\pi}{4}\right)$

(c) $\sec(270°)$

(d) $\tan\left(\frac{\pi}{3}\right)$

(e) $\cos\left(\frac{5\pi}{3}\right)$

(f) $\csc\left(\frac{11\pi}{6}\right)$

(g) $\sin(315°)$

(h) $\cos(150°)$

(i) $\arctan(1)$

(j) $\arcsin(1)$

(k) $\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

(l) $\sin^{-1}\left(-\frac{1}{2}\right)$

(m) $\tan^{-1}(0)$

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

(o) $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

4. To find the distance to a point on the opposite side of a lake, a surveyor measured the angles from two points that were 87 meters apart. The respective measured angles were 89° and 87° where each angle was measured with respect to the other point. Find the distance to the point on the opposite side of the lake from the point where the 89° angle was measured.

5. Simplify each expression as far as possible.

(a) $\tan^2(3\beta) - \dfrac{1}{\cos^2(3\beta)}$

(b) $\sqrt{1-\cos^2(\theta)}$ for θ in the third quadrant

6. Solve each of the following inequalities on the interval $[-\pi, \pi]$.

(a) $\tan(3x) > \sqrt{3}$

(b) $\sin(5x)\cos(3x) \geq \cos(5x)\sin(3x)$

7. Find all solutions to the following equations. Give exact answers.

(a) $\sec\left(4x - \dfrac{\pi}{6}\right) = 2$

(b) $3\cos^2(x) = \cos(x) + 4$