1. Simplify each expression.

   a) $(4y)^{-1}(3xz^0)^2$

   b) $\left(\frac{3}{x}\right)^2\left(\frac{2}{x}\right)^{-3}$

2. Find the domain of the given function.

   $f(x) = \frac{3}{\sqrt{4-x}}$

   $g(x) = 5$

3. Write an equation of the line that has the given characteristics.

   a) Passes through points $(-1, 4)$ and $(2, 3)$

b) Passes through points $(7, -5)$ and $(7, 3)$

c) Line, parallel to $y = \frac{1}{3}x + 2$ and passes through the point $(0, 1)$

4. Find all solutions.

a) $4x^2 - 5x - 6 = 0$

b) $x^3 + 2x^2 + x = 0$

5. Use these functions for the following questions:

$$f(x) = 2x + 1$$

$$g(x) = x^2 + 3x - 1$$

a) Find the function $f \circ f$

b) Find the function $g \circ f$

6. Find the inverse function of f.

$$f(x) = \frac{5}{3x^3 - 1}$$

7. Write the expression below as the logarithm base c of a single number.

$$\log_c(5) - \frac{1}{2}\log_c(25) + 2\log_c(3)$$

8. Find the solution. (Solve for the variable first, *then* grab a calculator)

a) $e^{3x} = 15$

b) $3^{4x} = 30$

c) $e^{3x+1} = 5(e^{3x+1} - 8)$

d) $\log_2(x) + \log_2(x+2) = \log_2(24)$

9. Modeling

a) The number N of bacteria in a culture follows the exponential growth model $N = Ae^{kt}$, where t is the time in hours. If the initial population is 50 and 6 hours later $N = 300$, when will $N = 1000$

b) The population p of a species of bird t years after it is introduced into a new habitat is given by:

$$p = \frac{3500}{1 + 4e^{-t/3}}$$

1) Determine the population size that was introduced into the habitat.

2) After how many years will the population be 2400?

10. Verify the following identities

a) $\cos(x)(\sec(x) + 2\sin(x)) = 1 + \sin(2x)$

b) $$\frac{1 - \cos(x)}{\sin(x)} + \frac{\sin(x)}{1 - \cos(x)} = 2\csc(x)$$

11. Rewrite as an algebraic expression of x.

$$\cos(\sin^{-1}(x))$$

12. Find all solutions.

a) $2\sin(3\theta) + 1 = 0$

b) $2\sin(\theta)\cos(\theta) - \cos(\theta) = 0$

13. Solve for all possible triangles: $A = 15°$, $a = 18$, $b = 34$

14. A pilot measures the angle of depression to two ships in the water in front of the plane as $15°$ and $25°$ respectively. If the pilot is flying at an altitude of 20,000 feet, find the distance between the two ships. Draw a picture.

15. Match the equation to the graph (Each one has a place...)

a) $\cos(x)$

b) $-3\cos(x)$

c) $2\sin(-x)$

d) $\cos(3x) - 1$

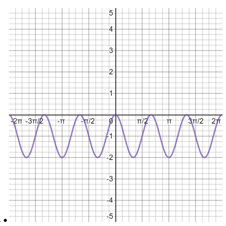
e) $4\cos(2x)$

f) $4\cos(\frac{1}{2}x)$

g) $2\sin(x)$

h) $\cos(3x) + 1$

EXTRA WORK SPACE.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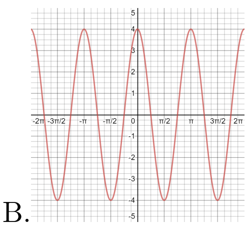
-2π -3π/2 -π -π/2 0 π/2 π 3π/2 2π

A.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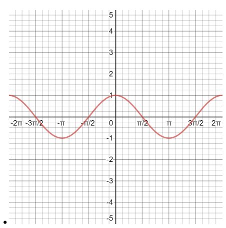
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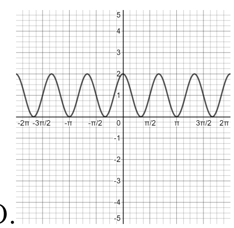
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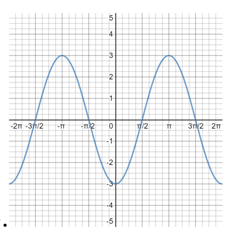
D.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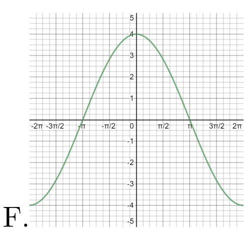
E.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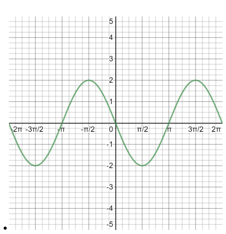
F.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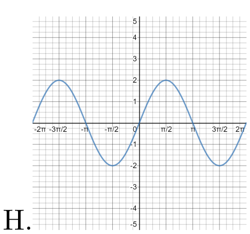
-2π -3π/2 -π -π/2 0 π/2 π 3π/2 2π

G.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-2π -3π/2 -π -π/2 0 π/2 π 3π/2 2π

H.

Formula Sheet

$$\sin(A+B) = \sin(A)\cos(B) + \sin(B)\cos(A)$$

$$\sin(A-B) = \sin(A)\cos(B) - \sin(B)\cos(A)$$

$$\cos(A+B) = \cos(A)\cos(B) - \sin(A)\sin(B)$$

$$\cos(A-B) = \cos(A)\cos(B) + \sin(A)\sin(B)$$

And as an application of these formulas...

$$\sin(2A) = 2\sin(A)\cos(A)$$

$$\cos(2A) = \cos^2(A) - \sin^2(A)$$

Also:

$$\frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}$$

$$c^2 = a^2 + b^2 - 2ab\cos(C)$$