

Name: Solutions

Math 201 - Quiz 1 - Tuesday, Sept 4, 2018

Instructions: Show your work, justify your answers, and write clearly. Put numerical answers in indicated boxes.

1. Find the natural domain and range for the function

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

and decide whether this function is even, odd, or neither.

Circle one: even odd neither

Domain:  $\frac{1}{x^2}$  is defined everywhere but at  $x=0$ .

Domain:

$$(-\infty, 0) \cup (0, \infty)$$

Range: the range of  $\frac{1}{x^2}$  is all  $x > 0$ .

Range:

$$(5, \infty)$$

So the range of  $\frac{1}{x^2} + 5$  is all  $x > 5$ .

even/odd?  $f(-x) = \frac{1}{(-x)^2} + 5 = \frac{1}{x^2} + 5 = f(x)$   
even ✓

2. If  $f(x) = x^2 + 1$  and  $g(x) = \sin(3x)$ , which of the following is  $(g \circ f)(x)$ ? (Circle one)

(a)  $\sin(3x^2 + 1)$

(b)  $\sin(3x^2 + 3)$

(c)  $(\sin(3x))^2 + 1$

(d)  $\sin(3x^2) + 1$

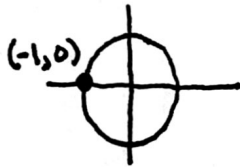
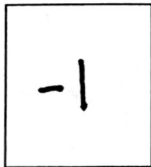
(e)  $3(\sin(x))^2 + 1$

(f) None of the above.

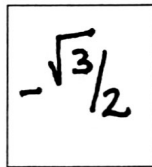
$$\begin{aligned} (g \circ f)(x) &= g(f(x)) = \sin\left(3 \underbrace{(x^2 + 1)}_{f(x)}\right) \\ &= \sin(3x^2 + 3) \end{aligned}$$

3. Simplify the following:

$\cos(\pi)$



$\sin(-\pi/3)$



$\sin(-\theta) = -\sin\theta$

$\tan(3\pi/4)$

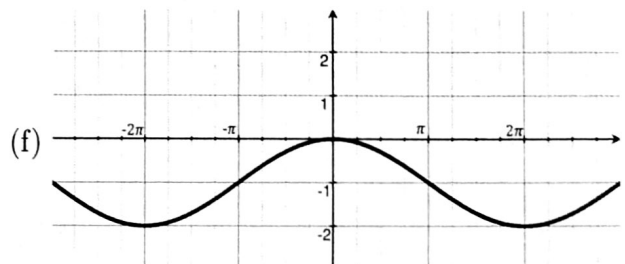
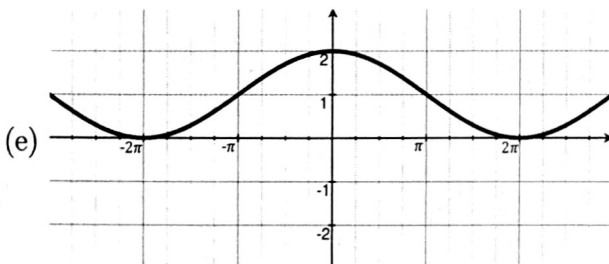
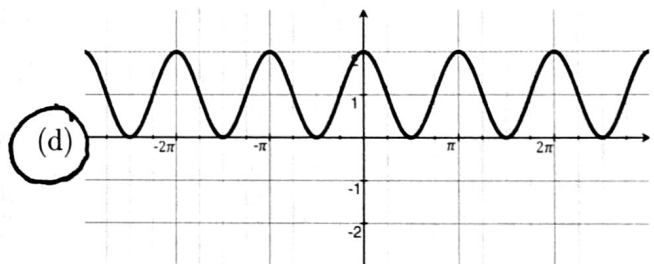
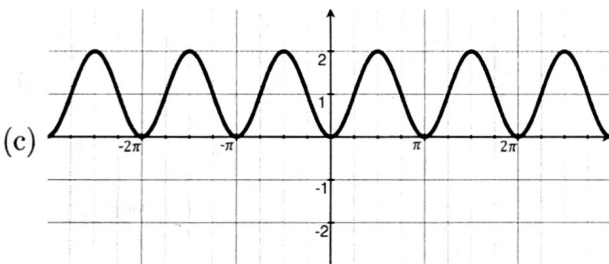
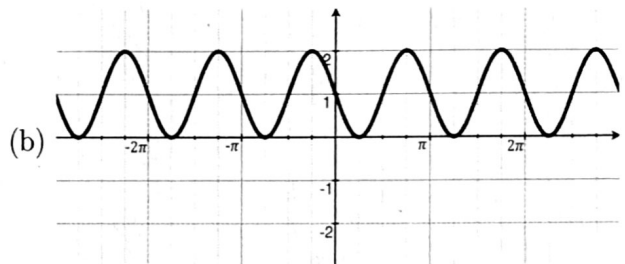
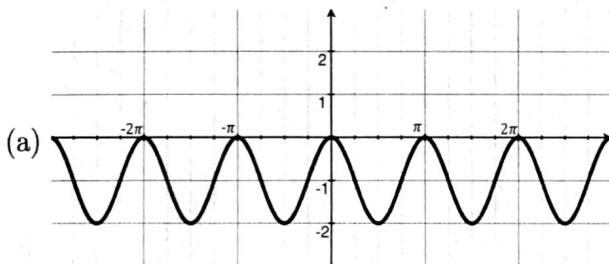


$\sin(3\pi/4) = \sin(\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(3\pi/4) = -\cos(\pi/4) = -\frac{\sqrt{2}}{2}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

4. Which of the following is the graph of  $y = \sin(2x + \frac{\pi}{2}) + 1$ ?



(g) None of the above.

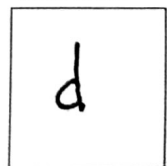
$$\sin(2x + \frac{\pi}{2}) = \sin(2(x + \frac{\pi}{4}))$$

$$\sin(x) \xrightarrow[\text{by } 2]{\text{compress}} \sin(2x) \xrightarrow[\text{left } \frac{\pi}{4}]{\text{shift}} \sin(2(x + \frac{\pi}{4}))$$

$$\downarrow \text{shift up } 1$$

$$\sin(2(x + \frac{\pi}{4})) + 1$$

Answer:



Sanity check:  
 at 0,  
 $y = \sin(2 \cdot 0 + \frac{\pi}{2}) + 1$   
 $= 1 + 1 = 2 \checkmark$