

*Draw a box around your final answers. No partial credit will be given.*

$$\text{Let } f(x) = \begin{cases} 2 + \sqrt{1-x}, & x \leq 1 \\ \frac{1}{1-x}, & x > 1 \end{cases}$$

201 #14 1. Find  $f(0) = 2 + \sqrt{1-0} = 2\sqrt{1} = 2(1) = \boxed{3}$

$$f(1) = 2 + \sqrt{1-1} = 2 + 0 = \boxed{2}$$

$$f(2) = \frac{1}{1-2} = \frac{1}{-1} = \boxed{-1}$$

2. Determine whether the point lies on the graph of the function.

$$(3,3); f(x) = \frac{x+1}{\sqrt{x^2+7}} + 2$$

2. #18  $3 = \frac{3+1}{\sqrt{3^2+7}} + 2 = \frac{4}{\sqrt{16}} + 2 = \frac{4}{4} + 2 = 1 + 2 = 3$

Yes The pt.  $(3,3)$  lies on the graph of  $f(x)$

3. Find the rules for the composition function:  $f \circ g$

$$f(x) = x^2 + x + 1; \quad g(x) = x^2$$

2.2 #25  $f(g(x)) = (x^2)^2 + (x^2) + 1$   
 $= \boxed{x^4 + x^2 + 1}$

4. Evaluate  $h(2)$  where  $h = g \circ f$

$$f(x) = x^2 + x + 1; \quad g(x) = x^2$$

~~$2.2$~~   ~~$\#31$~~   $h = g \circ f = g(f(x)) = (\cancel{x^2})^2 + (\cancel{x^2}) + 1 = x^4 + x^2 + 1$

~~$h(2) = (2)^4 + (2)^2 + 1 = 16 + 4 + 1 = 21$~~

$$g(f(x)) = \frac{(x^2 + x + 1)^2}{x^2 + x + 1} = x^4 + x^3 + x^2 + x^3 + x^2 + x + x^2 + x + 1 = x^4 + 2x^3 + 3x^2 + 2x + 1 \quad h(2) = \frac{16 + 16 + 12 + 4}{+12 + 4}$$

5. If the equation defines  $y$  as a linear function of  $x$ , write it in the form:  $y = mx + b$

$$3x - 6y + 7 = 0$$

$$h(2) = 49$$

~~$2.3$~~   $-6y = -3x - 7$   
 ~~$\#6$~~   $6y = 3x + 7$   
 $y = \frac{3}{2}x + \frac{7}{6}$  so  $y = \frac{1}{2}x + \frac{7}{6}$

6. A manufacturer has a monthly fixed cost of \$100,000 and a production cost of \$14 for each unit produced. The product sells for \$20/unit. Compute the profit (loss) corresponding to a production level of 12,000 units.

~~$2.3$~~   ~~$\#18 d.$~~   $P(x) = 20x - 6x - \$100,000$   
 $P(12,000) = 6(12,000) - \$100,000$   
 $= 72,000 - \$100,000$   
 $= -\$28,000$

7. Find the indicated limit, if it exists

$$\lim_{x \rightarrow -5} \frac{x^2 - 25}{x + 5} = \lim_{x \rightarrow -5} \frac{(x+5)(x-5)}{(x+5)}$$

$$= \lim_{x \rightarrow -5} (x-5) = (-5-5) = -10$$

8. Find the indicated limit, if it exists

$$\lim_{x \rightarrow \infty} \frac{2x^2 + 3x + 1}{x^4 - x^2} = \lim_{x \rightarrow \infty} \frac{(2x+1)(x+1)}{x^2(x^2-1)}$$

*#2.4*

$$\lim_{x \rightarrow \infty} \frac{2x+1}{x^2(x-1)} = \lim_{x \rightarrow \infty} \frac{\frac{2}{x} + \frac{1}{x^2}}{(x-1)} = \boxed{0} \text{ as numerator is zero}$$

9. Use the Limit Definition formula to find the derivative of:  $f(x) = 2x + 7$ .

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{2(x+h) + 7 - 2x - 7}{h}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{2h}{h} = \lim_{h \rightarrow 0} 2 = \boxed{2}$$

10. Suppose the distance  $s$  (in feet) covered by a car moving along a straight road after  $t$  sec is given by the function  $s = f(t) = 2t^2 + 18t$ . Calculate the Instantaneous velocity of the car when  $t=15$ .

*#2.6*  $f'(t) = 4t + 18$

*#2.9b.*  $f'(15) = 4(15) + 18 = 60 + 18 = \boxed{78 \frac{\text{ft}}{\text{sec}}}$

