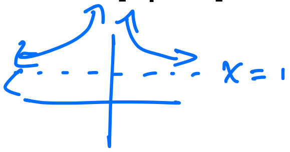
Name: Solutions ________ / 25

There are 18 questions worth 25 points on this quiz. No aids (book, calculator, etc.) are permitted. **Show all work for full credit.**

1. [1 point] Determine the domain and range of $f(x) = \frac{1}{x^2} + 1$. Write your answer in interval notation.



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

Range $= (1, \infty)$

2. [1 point] For $f(x) = 8 - x^2$ and $g(x) = 2 - x$, find the composition $f \circ g$ and simplify your answer.

$f(g(x)) = f(2-x) = 8-(2-x)^2$

$= 8 - (4 - 4x + x^2)$

$= 4 + 4x - x^2$

$f \circ g(x) = 4 + 4x - x^2$

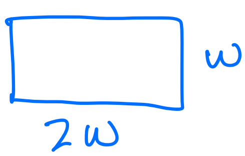
3. [1 point] Write the expression $\frac{x^7 y^4 z}{x^3 y^{-1} z^3}$ in the form $x^a y^b z^c$. That is, write the expression with all terms in the numerator.

$\frac{x^7 y^4 z}{x^3 y^{-1} z^3} = x^7 x^{-3} y^4 y^1 z z^{-3}$

$= x^4 y^5 z^{-2}$

$x^4 y^5 z^{-2}$

4. [1 point] A rectangle has length ℓ that is twice its width, w. Find an expression for the area, A, of the rectangle in terms of its width, w.



$A(w) = 2w^2$

5. [2 points] Write an equation of the line between the points $(-4, 5)$ and $(2, 1)$.

Slope $= \frac{1-5}{2-(-4)} = \frac{-4}{6} = \frac{-2}{3}$

alternate forms

$y = -\frac{2}{3}(x+4) + 5$

$y = -\frac{2}{3}x + \frac{4}{3} + \frac{3}{3} = -\frac{2}{3}x + \frac{7}{3}$

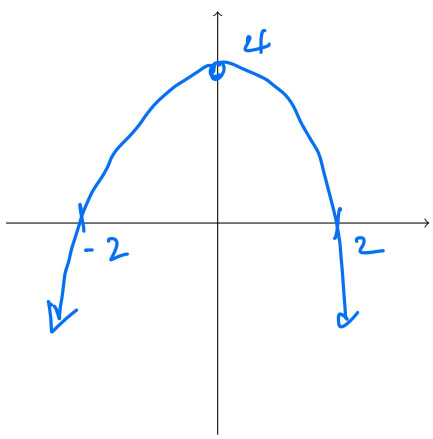
$y = \frac{-2}{3}(x-2) + 1$

Is the line increasing, decreasing, horizontal or vertical. decreasing (negative slope)

6. [1 point] Simplify the expression $\frac{2x^3+2x^2y}{4x^2+12xy}$ by cancelling any common factor in both the numerator and denominator.

$$\frac{2x^3+2x^2y}{4x^2+12xy} = \frac{\cancel{2x^2}(x+y)}{{}_2\cancel{4x}(x+3y)} = \frac{x(x+y)}{2(x+3y)} \qquad \frac{x(x+y)}{2(x+3y)} = \frac{x^2+xy}{2x+6y}$$

7. [2 points] Sketch the graph of $f(x) = 4 - x^2$. Label any x- or y-intercepts in your sketch.



asymptote(s)? none

8. [2 points] Use the piecewise defined function $f(x) = \begin{cases} \frac{x}{x-1} & x \le 0 \\ \sqrt{x} & x > 0 \end{cases}$.

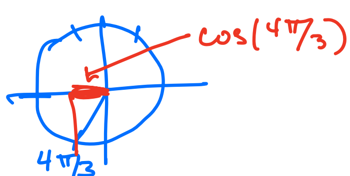
a. Find $f(-1)$. $= \frac{-1}{-2} = 1/2$ $\qquad$ 1/2

b. Determine x such that $f(x) = 4$. $\qquad$ $x = 16$

$f(x) = 4 \Rightarrow \sqrt{x} = 4 \Rightarrow x = 16$

$\Rightarrow \frac{x}{x-1} = 4 \Rightarrow x = 4(x-1) = 4x - 4 \Rightarrow 3x = 4 \Rightarrow x = 4/3$ but not when $x \le 0$

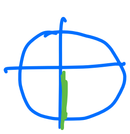
9. [1 point] Evaluate $\cos(4\pi/3)$ exactly.



$-1/2$

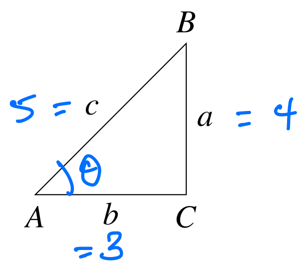
10. [1 point] Solve the equation $\sin(x) + 1 = 0$ on the interval $0 \le x < 2\pi$.

$\sin(x) + 1 = 0 \Rightarrow \sin x = -1$



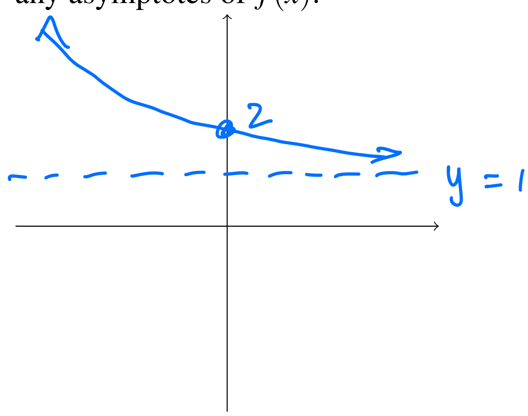
$x = 3\pi/2$

11. [1 point] In the right triangle below, $a = 4$ and $c = 5$. Determine the value of $\tan(A)$, the tangent function at angle A.



$\tan A = 4/3$

12. [2 points] Sketch the graph of $f(x) = e^{-x} + 1$. Label any x- or y-intercepts. Give the equation of any asymptotes of $f(x)$.



asymptote(s)? $y = 1$

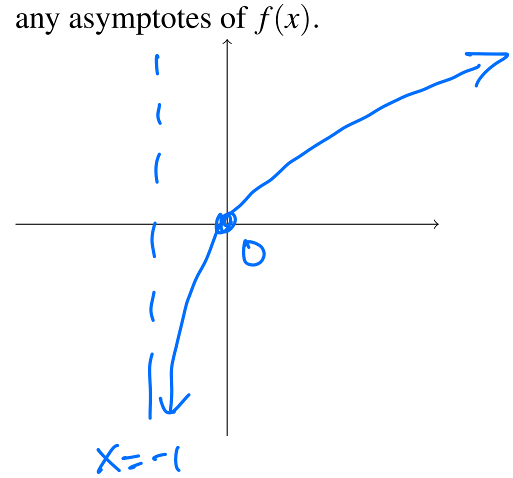
13. [1 point] Solve the equation $18 - 4^x = 10$.

① $18 - 4^x = 10 \Rightarrow 8 = 4^x \Rightarrow 2^3 = 2^{2x}$

② $\Rightarrow \log_4(8) = \log_4(4^x) = x \Rightarrow x = \frac{3}{2}$

$x = \log_4(8) = \frac{\log_2(8)}{\log_2(4)} = \frac{3}{2}$

14. [2 points] Sketch the graph of $f(x) = \ln(x+1)$. Label any x- or y-intercepts. Give the equation of any asymptotes of $f(x)$.



asymptote(s)? $x = -1$

15. [1 point] Solve the equation $\dfrac{\ln(x-1)}{3} = 4$.

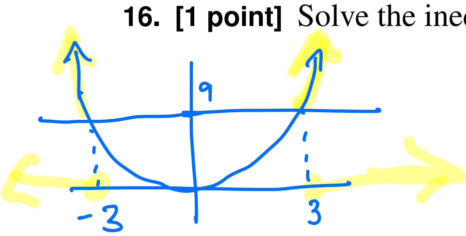
$\ln(x-1) = 12$

$x-1 = e^{12}$

$x = e^{12}+1$

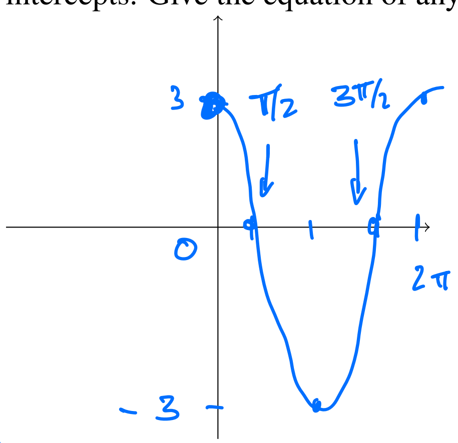
$x = e^{12} + 1$

16. [1 point] Solve the inequality $x^2 \geq 9$. Write your answer in interval notation.



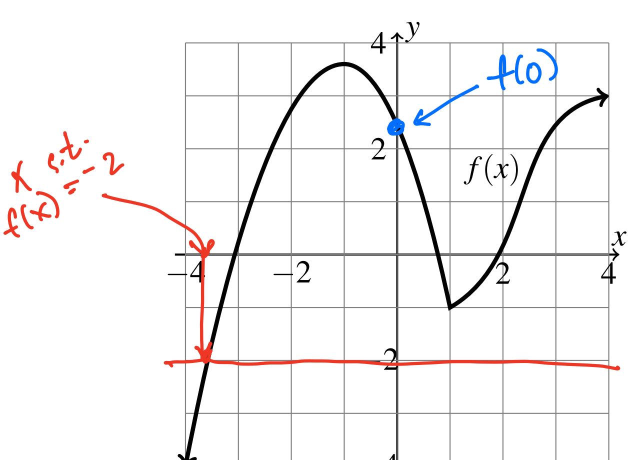
$(-\infty, -3] \cup [3, \infty)$

17. [2 points] Sketch the graph of $f(x) = 3\cos(x)$ on the interval $0 \leq x \leq 2\pi$. Label any x- or y-intercepts. Give the equation of any asymptotes of $f(x)$.



asymptote(s)? none

18. [2 points] Use the graph of $f(x)$ below to answer the questions.



a. **Estimate** $f(0)$. 2.5

b. **Estimate** an x-value such that $f(x) = -2$.

-3.6

(a little bigger than $-3.5\ldots$)