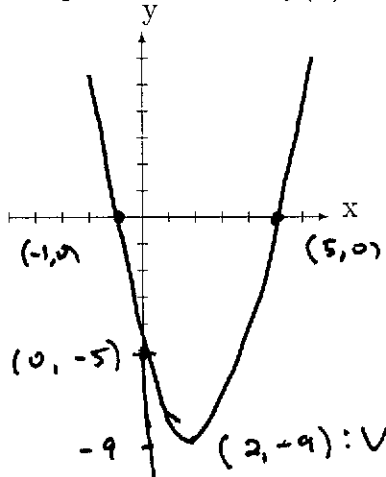


Work carefully and neatly and remember that I cannot grade what I cannot read. You must show all relevant work in the appropriate space. You may receive NO CREDIT for a correct answer if there is insufficient supporting work. Place your answers in the boxes provided. Notes, books and graphing calculators are NOT ALLOWED.

- [8pts] 1. Graph the function $f(x) = x^2 - 4x - 5$. Include the vertex and all intercepts.



$$x = 0 \quad y = -5 \text{ - } y\text{-intercept}$$

$$x^2 - 4x - 5 = 0$$

$$(x - 5)(x + 1) = 0$$

$$\boxed{x = 5, x = -1} \text{ } x \text{ intercepts}$$

$$V: x = \frac{-(-4)}{2} = 2$$

$$f(2) = 4 - 8 - 5 = -9$$

- [8pts] 2. Find the equation of the line connecting the points $(1, 2)$ and $(-1, -2)$.

$$m = \frac{-2 - 2}{-1 - 1} = \frac{-4}{-2} = 2$$

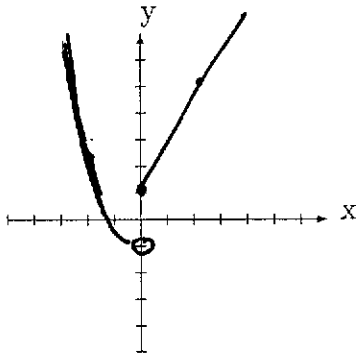
$$y - 2 = 2(x - 1)$$

$$y = 2x$$

Answer:

$$y = 2x$$

- [8pts] 3. Graph the function $f(x) = \begin{cases} x^2 - 1 & \text{If } x < 0. \\ 2x + 1 & \text{If } x \geq 0 \end{cases}$



[8pts] 4. Find the domain of the function $f(x) = \frac{2x}{\sqrt{3x+6}}$

$$\begin{aligned} 3x+6 &> 0 \\ 3x &> -6 \\ x &> -2 \end{aligned}$$

Answer:

$$x > -2$$

[16pts] 5. Let $f(x) = \frac{3x-1}{x+2}$ and $g(x) = x-3$.

(a) Find $f(3)$

$$f(3) = \frac{9-1}{3+2} = 8/5$$

Answer:

$$8/5$$

(b) Find $g(x) \circ f(x)$.

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

Answer:

$$\frac{3x-1}{x+2} - 3$$

[6pts] 6. What should A equal in the following function in order for the function to be continuous at $x = 1$?

$$y = f(x) = \begin{cases} x-3 & \text{if } x < 1. \\ Ax+1 & \text{if } x \geq 1 \end{cases}$$

$$1-3 = A+1$$

$$-2 = A+1$$

$$-3 = A$$

Answer:

$$A = -3$$

[8pts] 7. Find the points of intersection (if any) of the curves $y = x^2$ and $y = 15 - 2x$.

$$x^2 = 15 - 2x$$

$$\begin{aligned} x^2 + 2x - 15 &= 0 \\ (x+5)(x-3) & \end{aligned}$$

$$x = -5, x = 3$$

Answer:

$$(-5, 25) \text{ and } (3, 9)$$

points

$$(-5, 25)$$

$$(-5, f(-5)) \quad (3, f(3))$$

[14pts] 8. Find the following limits if they exist.

$$(a) \lim_{x \rightarrow 2} \frac{x^2 - x - 3}{x^2 - 5x + 6} = \frac{4 - 2 - 3}{4 - 10 + 6} = \frac{-1}{0} \cdot \text{DNE}$$

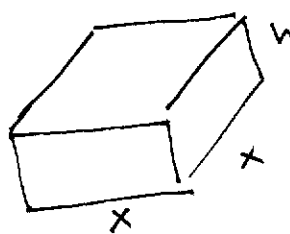
Answer: DNE

$$(b) \lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x + 1} = \frac{9 - 6 - 3}{3 + 1} = \frac{0}{4} = 0$$

Answer: 0

[8pts] 9. A closed box with a square base has a surface area of 2,000 square inches. Express its volume as a function of the length of its base.

SA = Top + Bot + 4 Sides
 $= x^2 + x^2 + 4xh$
 So
 $2x^2 + 4xh = 2000$
 $4xh = 2000 - 2x^2$
 $h = \frac{2000 - 2x^2}{4x}$



Answer: $\frac{x(2000 - 2x^2)}{4}$

$$V = x^2 h$$

$$V = x^2 \left[\frac{2000 - 2x^2}{4x} \right]$$

[16pts] 10. Let $f(x) = x^2 - 2x$.

(a) Show that the derivative of $f(x)$, using the limit is $2x - 2$.

$$\lim_{h \rightarrow 0} \frac{(x+h)^2 - 2(x+h) - (x^2 - 2x)}{h}$$

Answer:

$$= \frac{x^2 + 2xh + h^2 - 2x - 2h - x^2 + 2x}{h} = \frac{2xh - 2h}{h} = \lim_{h \rightarrow 0} \frac{2x - 2}{1} = 2x - 2$$

(b) Find the equation of the tangent line to $f(x)$ at $x = 3$

$$f'(3) = 2(3) - 2 = 4 \quad \text{so } m = 4, (3, 3)$$

$$f(3) = 9 - 6 = 3$$

$$y - 3 = 4(x - 3) = 4x - 12$$

$$\boxed{y = 4x + 9}$$