

Exam 1

Student Name: _____

Student ID#: _____

Each problem is worth 6 points. Give a complete solution to receive the full credit!

1. Replace the question mark by $<$, $>$, or $=$, whichever is correct.

(a) $\left(\frac{1}{2}\right)^{-2022} ? 2^{2022}$

(b) $\frac{1}{3} ? 0.333333333333$

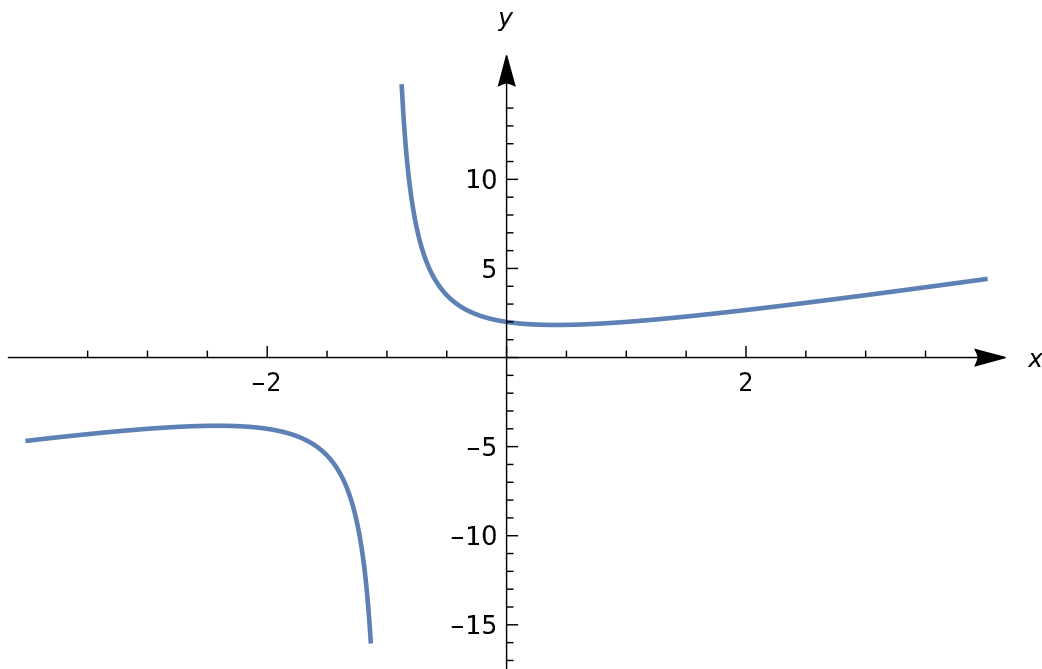
(c) $\sqrt[6]{2} ? \sqrt[3]{\sqrt{2}}$

(d) $e^{-2} ? \frac{1}{e^{-2}}$

(e) $\sqrt{2} ? 1.41$

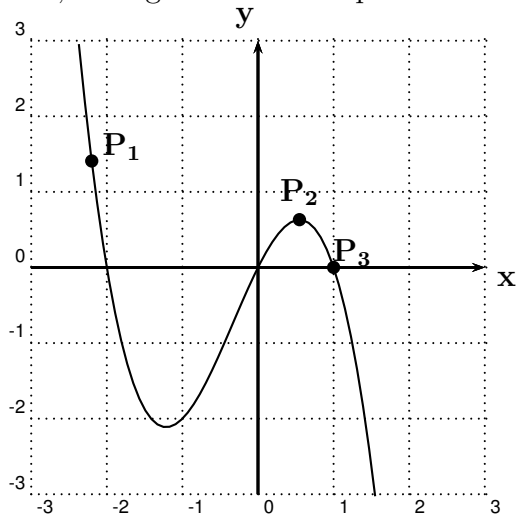
(f) $\pi ? 3.14$

2. Find the domain and range of the function $f(x)$ whose graph is shown below.



3. Suppose that $f(x) = -3x + 2$. Simplify the expression $\frac{f(x+h)-f(x)}{h}$ where $h \neq 0$.

4. By imagining tangent lines at points P_1 , P_2 , and P_3 , state whether the slopes are positive, zero, or negative at these points.



5. Find the equation of the tangent line to $f(x) = \frac{3}{\sqrt{x}}$ at $x = 9$.

6. Find the average rate of change of the function $f(x) = \frac{1}{x+1}$ over the interval $[1, 3]$.

7. Find functions f and g such that the function

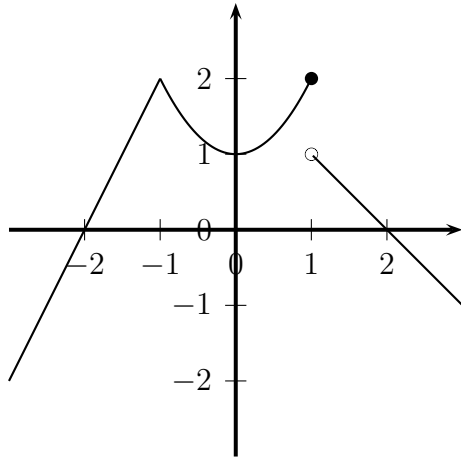
$$\sqrt{\frac{1-2x}{x+1}}$$

is the composition $(g \circ f)(x)$. Then use the chain rule to find its derivative with respect to the variable x .

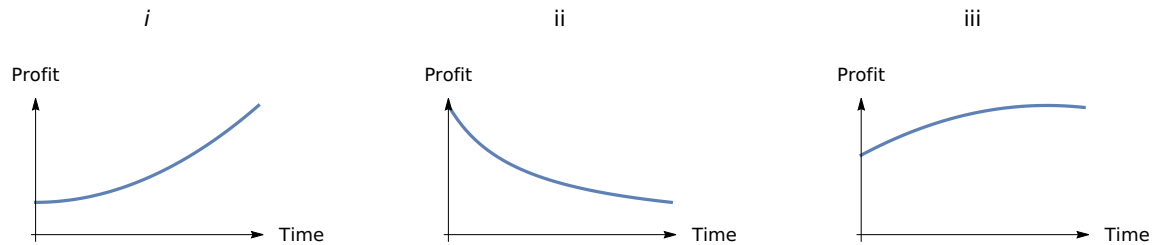
8. How many real solutions does the equation $x^2 - \pi x + 2022 = 0$ have?

9. For the function graphed below, find the x -values at which:

- (a) The function is discontinuous.
- (b) The function is nondifferentiable.



10. Each of the following three graphs, labeled i, ii, and iii matches only one of the following four descriptions of a company's profit over time, labeled a, b, c, and d. For each graph choose the most appropriate description.



- (a) Profits were rising, but more and more slowly.
- (b) Profits were declining but the rate of decline was slowing.
- (c) Profits were growing increasingly rapidly.
- (d) Profits were declining but the rate of decline was increasing.