

Note: This is a practice midterm and is intended only for study purposes. The actual exam will contain different questions and perhaps have a different layout.

1. TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F.

T F $\frac{3x+y}{3z} = \frac{x+y}{z}$

T F $(x+y)^2 = x^2 + y^2$

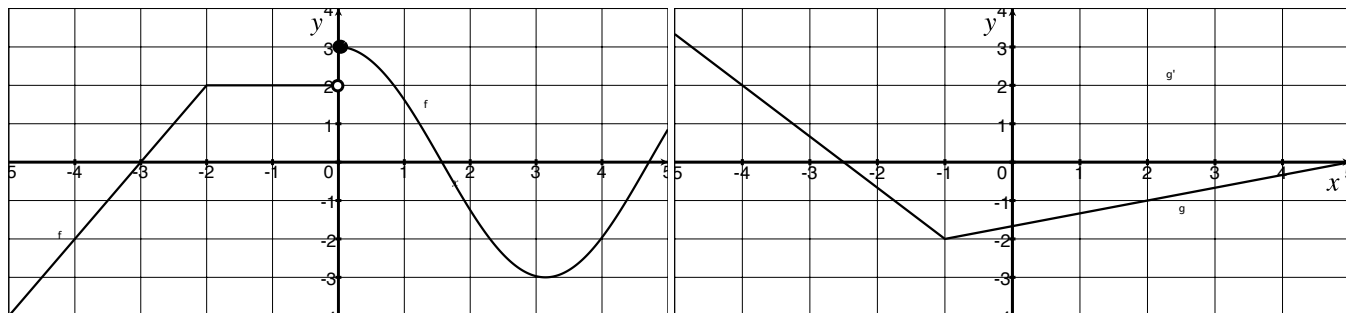
T F $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{\lim_{x \rightarrow a} f(x)}{\lim_{x \rightarrow a} g(x)}$ for all a

T F No profit is made when $MR < MC$

Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

2. Find $\lim_{x \rightarrow 3} \frac{x^2 - 4x + 3}{(x-3)(x+1)}$ using properties of limits.

3. Let f be the function whose graph is on the left and g be the function whose graph is on the right.



(a) [10] Find the following (if they exist):

$$\lim_{x \rightarrow -2} f(x)$$

$$\lim_{x \rightarrow -1} \left(\frac{g(x)}{5} - 2 \right)$$

$$\lim_{x \rightarrow 0} 2f(x)$$

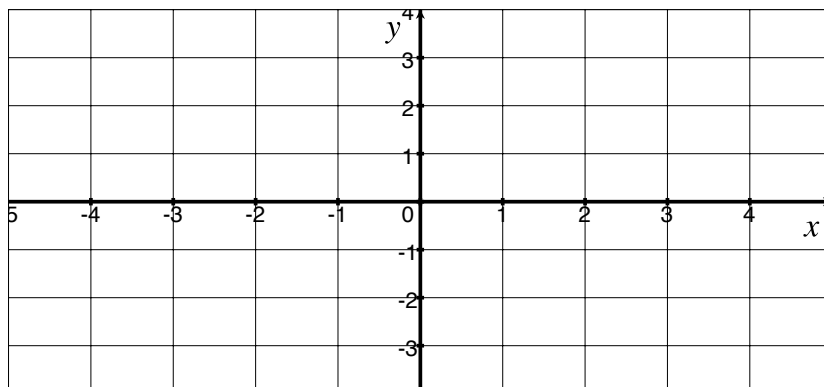
$$g(-4)$$

$$(g \circ f)(-4)$$

$$g'(-4)$$

(b) Find all the x values that f is discontinuous.

(c) [3] Sketch the graph of g' .



4. The demand curve for a product is given by $q = 300 - 3p$, where p is the price of the product and q is the quantity consumers will buy at that price.

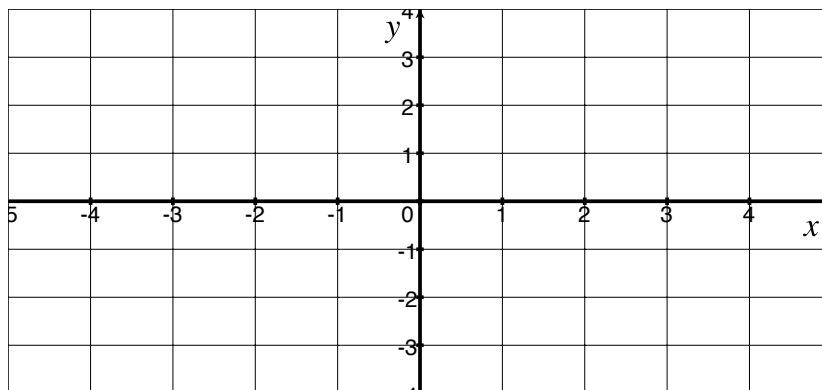
(a) [2] Write the revenue as a function of *only* price (there should be no q 's).

(b) [3] Find the marginal revenue when the price is \$10, and interpret your answer in terms of revenue.

(c) [4] If the marginal cost of making the product is \$20, and the business has the ability to set the price (by controlling q), what should the business set the price to so as to maximize profit?

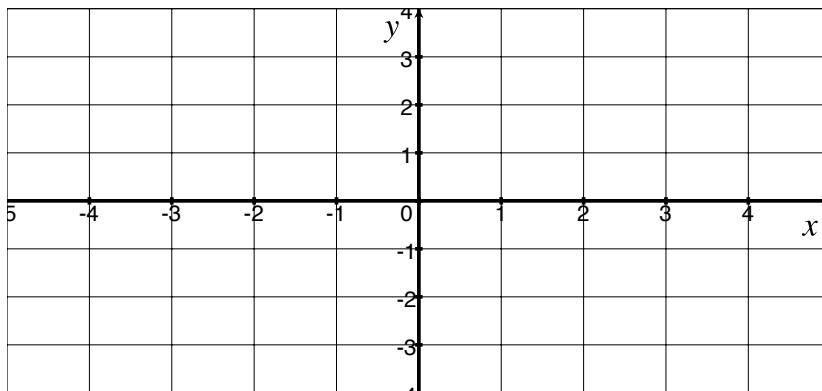
5. Sketch a graph of a function α that satisfies *all* of the following:

$\alpha(-1) = -3$, $\lim_{x \rightarrow -1} \alpha(x) = 2$, α is not continuous at $x = 4$, and for all $x > 0$, $\alpha''(x) < 0$.



6. Let $m(x) = (x + 2)^2$.

(a) [1] Carefully graph f .



(b) Estimate $m'(-3)$.

(c) Find $m'(-3)$ algebraically.

(d) Draw the line tangent to the graph of m at $x = -3$.

(e) Find an equation for the line tangent to the graph of m at $x = -3$.

7. A company's cost of producing q liters of a chemical is $C(q)$ dollars; this quantity can be sold for $R(q)$ dollars. Suppose $C(2000) = 5930$ and $R(2000) = 7780$.

(a) What is the profit at a production level of 2000?

(b) When production is increased to 2001 the total cost is \$5930.10 and total revenue is \$7782/5. Estimate $MC(2000)$ and $MR(2000)$.

(c) If $MC(2000) = 2$ and $MR(2000) = 2.5$, what is the approximate change in profit if q is increased from 2000 to 2010?

(d) Should the company increase or decrease production from $q = 2000$?

8. □ Find the derivative of $f(x) = \frac{2}{x-3}$ algebraically.