EXAM 2 # TQS 211 Practice

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

1. [] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f and g be functions, and x and y be real numbers.

   T F $(2f)'(x) = 2f'(x)$

   T F $\cos(x + y) = \cos(x) + \cos(y)$

   T F If $f'(a) < 0$, then the graph of $f(x)$ is decreasing when $x = a$.

   T F When $MC = MR$ the company may be maximizing profit.

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

2. [] For each rule of f given below, find $f'(x)$.

$$f(x) = \sin(x) + \frac{3}{x}$$

$$f(x) = 2x^2 + \ln(7x^2)$$

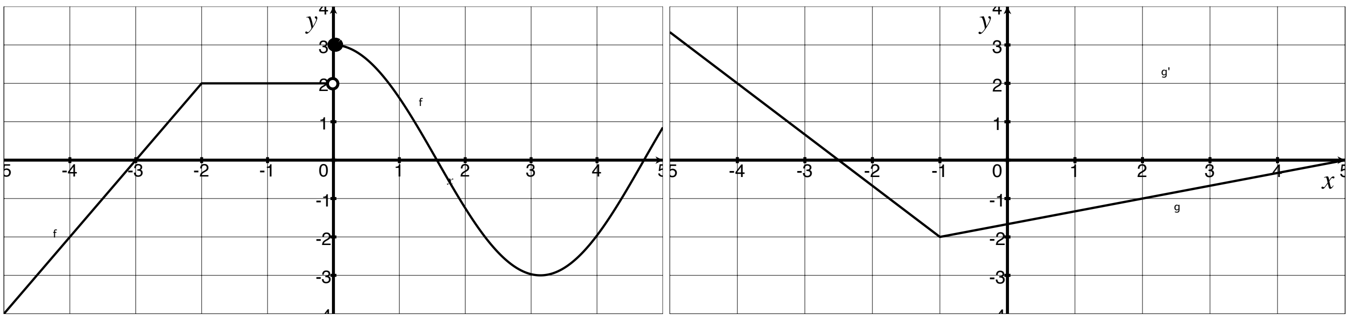
$$f(x) = \frac{3^x \cos(x)}{\sin(x)}$$

$$f(x) = (\sqrt{3x^4 - x})(e^x - 4)$$

$$f'(x) = \frac{6x^4 - x^{\frac{1}{3}}}{\sqrt{x}}$$

$$f(x) = (-4x + 7)^{12}(-2x^2 - 3x)^9$$

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] Estimate the following (if they exist):

$f'(-3)$ $\qquad\qquad$ $\left(\dfrac{f}{g}\right)'(-4)$

$(f \cdot g)'(-3)$ $\qquad\qquad$ $(f \circ g)'(2)$

4. The oil spill in the gulf is being fed by a well that produces approximately ??? cubic meters per day. Assume for now that the oil spill is approximately circular and the thickness of the oil is uniformly half a meter thick.

(a) Write down a relationship between the total volume of the oil and the radius of the oil spill.

(b) What rate is the volume of the oil cylinder expanding per hour?

(c) How fast is the radius of the oil spill changing when the oil spill is 200 meters across?

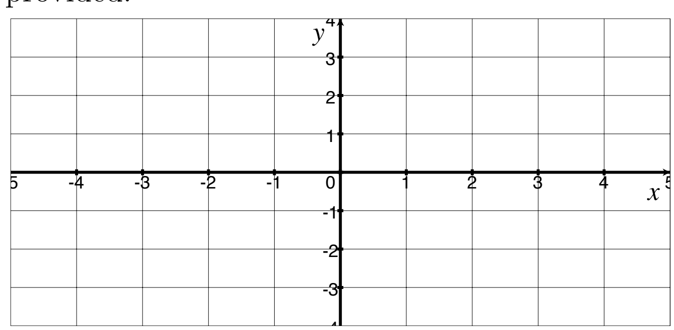
5. There is a "Rule of 70" or "Rule of 7" that commonly arrises in economic or financial circles. The rule is as follows: The time is takes your money to double at an interest rate of r is approximately $\frac{70}{r}$. We will find out where this rule comes from.

   (a) Assume you have P_0 dollars to invest. You find an investment that promises an effective annual interest rate of $r\%$. Write down a function that describes how much money you have after t years. (This is a throw back from §1.5.)

   (b) We want to know when the investment doubles, that is, find t so that you have a total of $\$2P_0$.

   (c) Draw the graph of $\ln x$ on the axis provided.

   (d) Find the equation of the line that is tangent to the graph of $\ln x$ at $x = 1$.



   (e) Use the line you found in (d) to approximate the function $\ln x$ when x is near 1 to simplify your answer in (b). Note, since r is usually closer to .05 than to .95, we can think of $1 + r$ as a number close to 1.

6. [] A manufacture has been selling 1000 televisions a week at \$360 each. A market survey indicates that for each \$26 rebate offered to a buyer, the number of sets sold will increase by 260 per week. Let q be the number of televisions demanded and p be the price.

   (a) Assume the relationship between the demand q and the price p is linear. Express p as a function of q.

   (b) Use the work from above to express the revenue, R, as *only* a function of q.

   (c) If the weekly cost function if $60000 + 120q$, where q is the number of television sets sold per week, how should it set the size of the rebate to maximize its profit?