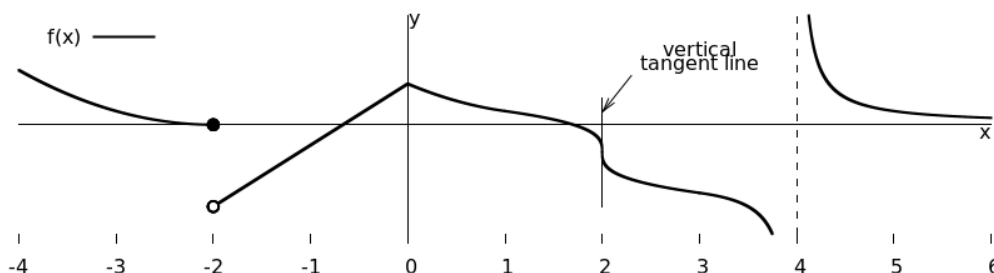# MAC2311: Calculus 1 - Section 1
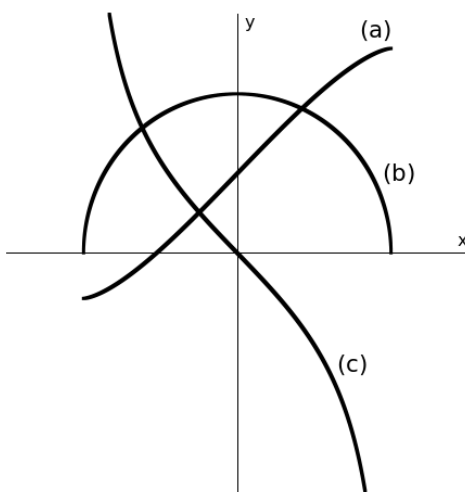
Test 2 Review   February 18, 2015

1. Use the following graph of f to answer the questions below it.

   (a) List all x-values at which f is not differentiable: _____

   (b) For each x-value that you listed in part (a), state why f is not differentiable.

2. The following figure shows the graphs of f, f', and f''.

   Complete the following statements by filling in one of f, f', or f'' in each blank.

   (a) is the graph of _____

   (b) is the graph of _____

   (c) is the graph of _____

3. Let f and g be differentiable functions and let c be a constant. Complete each of the following equations using differentiation rules.

   (a) $\frac{d}{dx}\left[cf(x)\right] =$

   (b) $\frac{d}{dx}\left[f(x) + g(x)\right] =$

   (c) $\frac{d}{dx}\left[f(x) - g(x)\right] =$

   (d) $\frac{d}{dx}\left[f(x)g(x)\right] =$

   (e) $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] =$

   (f) $\frac{d}{dx}\left[f(g(x))\right] =$

   (g) $\frac{d}{dx}\left(x^n\right) =$

   (h) $\frac{d}{dx}\left(e^x\right) =$

   (i) $\frac{d}{dx}\left(a^x\right) =$

   (j) $\frac{d}{dx}\left(\sin x\right) =$

   (k) $\frac{d}{dx}\left(\cos x\right) =$

   (l) $\frac{d}{dx}\left(\ln x\right) =$

   (m) $\frac{d}{dx}\left(\log_a x\right) =$

4. Let $f(x) = (1 - e^x)(x + e^x)$
   (a) Differentiate $f(x)$.
   (b) Find the slope of the line tangent to f at $x = 1$.

5. Prove each of the following using the quotient rule
   - $\frac{d}{dx}(\tan x) = \sec^2 x$
   - $\frac{d}{dx}(\csc x) = -\csc x \cot x$
   - $\frac{d}{dx}(\sec x) = \sec x \tan x$
   - $\frac{d}{dx}(\cot x) = -\csc^2 x$

6. Differentiate $e^{\tan(x^{2/3})}$.

7. Use implicit differentiation to find $\frac{dy}{dx}$ if $x^3 + y^3 - 2xy = 1$.

8. Use logarithmic differentiation to differentiate $y = (\sin x)^{\sqrt{x}}$.

9. The position of a particle is given by $s(t) = t^3 - 9t^2 + 24t$ where s is measured in meters and t is measured in seconds.
   (a) Find the velocity at time t.
   (b) What is the velocity after 4 s? 6 s?
   (c) When is the particle at rest?
   (d) When is the particle moving forward?
   (e) Draw a diagram to represent the motion of the particle.
   (f) Find the total distance traveled by the particle during the first five seconds.
   (g) Find the acceleration at time t and after 3 s.
   (h) Graph the position, velocity, and acceleration functions for $0 \leq t \leq 6$