Warning. This is a rough draft. More questions will be added (and possibly removed) to this Test Prep as we cover more topics. Last updated on 2016/09/19 at 17:12:55

1. Let $F(t)$ be a function defined by $F(t) = t^2 + 3t$.

   (a) Evaluate the *difference quotient*

   $$\frac{F(t + \Delta t) - F(t)}{\Delta t}.$$

   (b) Compute the *net change* in F over the interval $[1, 3]$.

   (c) Compute the *average rate of change* in F over the interval $[1, 3]$.

2. Function g is defined by

   $$g(x) = \frac{(x-4)^{10} - x}{8}.$$

   Evaluate the following and simplify as much as possible. Simplified fractions are fine; don't get decimals.

   (a) $g(5) - g(4)$

   (b) $g(x + 4)$

3. Find the zeros of the following functions. If no zeros exist, say so.

   (a) $f(t) = t^3 - 5t^2$

   (b) $g(t) = 2t^3 - 4t$

   (c) $h(x) = x^2 - 5x + 6$

   (d) $h(x) = x^2 - 5x + 5$

   (e) $j(x) = (x + 5)(x + 1)(x - \frac{1}{2})(x - 10)$

   (f) $h(x) = x^2 + x + 3$

4. Find the slope of the line through the points $(0, 12)$ and $(1, 6)$.

5. Write an equation for a line with slope -5, passing through the point $(0, 12)$.

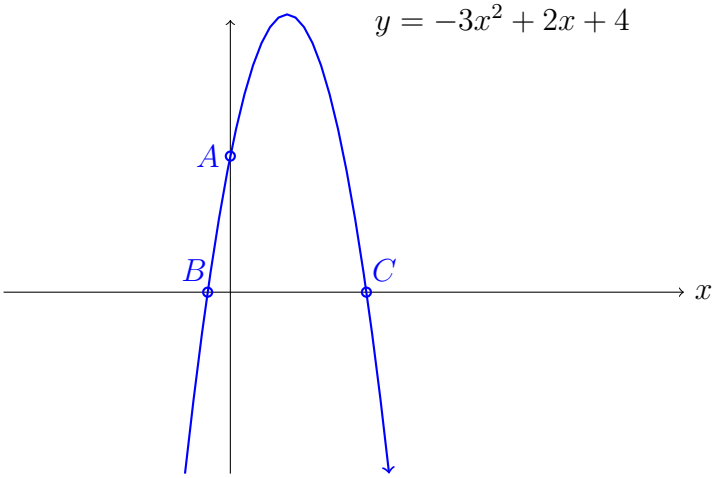
6. Let $f(x) = -2x^3 + x^2 - 5x + 12$.

   (a) Find the average rate of change in f over $[0, 1]$.

   (b) Find the slope of the secant line between the points $(0, f(0))$ and $(1, f(1))$.

7. The figure shows the graph of a quadratic function:

   $$y = -3x^2 + 2x + 4.$$



Find the *exact* coordinates of each of the three marked points A, B, and C. Note, A is the point where the graph crosses the y-axis; B and C are the points where it crosses the x-axis.

8. Ida, the Idealized Bicyclist is moving along a straight road with position function

$$f(t) = (1/2)t + 5 \quad \text{meters at time } t \text{ seconds}$$

(a) Compute the following: $f(0)$, $f(10)$, $f(t+4)$, and $f(t+\Delta t)$.

(b) Explain in words what the value you got for $f(10)$ means in terms of Ida the bicyclist.

(c) Compute the *net change* in f over the interval $[2, 10]$, and the *average rate of change* in f over the same interval. Give the appropriate units for both answers.

(d) Compute the net change in f over the interval $[0, 20]$, and the average rate of change in f over the same interval. Give the appropriate units for both answers.

(e) Draw the graph of the function $f(t)$ – that is, draw Ida's "Position vs Time" graph. Set up appropriate axes and label them with the variable names and units; make it something that somebody else could usefully read and get information from.

(f) Let's call Ida's *velocity* function $v(t)$ (meters per second, at time t, where t is measured in seconds). Now, **I haven't given you a formula for v(t) yet**. Can you reason out what function this must be?
a. $v(t) =$____ b. Explain your reasoning briefly.

(g) Draw the graph of $v(t)$ – that is, draw Ida's "Velocity vs. Time" graph.

(h) True/False: (f and v are the same functions from the problems above.)

i. ____ The average rate of change in f is the same over every possible time interval.

ii. ____ The net change in f is the same over every possible time interval.

iii. ____ The average rate of change in v is the same over every possible time interval.

iv. ____ v is increasing over every interval.

v. ____ f is increasing over every interval