Each answer in Part A, has a value of 1 or 2 marks. You need not show your work—no part marks will be given. Write your answers in the spaces provided.

In Part B, clearly show all work and justify your answers.

October 2006 Midterm Part A

- 1. A small company that manufactures cloth handbags has a fixed cost of \$400 per month and a variable cost of \$20 per handbag. The handbags are sold for \$30 each. Let *g* be the number of handbags produced and sold in a month.
 - (a) Find a formula for the cost function C(g).
 - (b) Find a formula for the revenue function R(g).
 - (c) For what value of g will the monthly profit be \$2400?

2. Write the function $h(t) = 15e^{(\ln 3)t}$ in the form $h(t) = 15a^t$.

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3. Given that f(2) = 3, g(2) = 0, f'(2) = -1, $g'(2) = \frac{1}{3}$, and h(x) = f(x)g(x); find h'(2).

4. An investment earns 8% interest compounded quarterly. How long will it take for this investment to double in value? (Leave the answer in logarithmic form.)

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5. Use the graph below to find the indicated quantities. If they don't exist, write "does not exist".



(g) Explain your answer to (f) using the definition of continuity.

6. Given the graph of y = f(x) below, select the graph which best represents the graph of y = f'(x).



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(continued)

6. Circle one of the following:



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7. The population of a small agricultural town decreases from 16,000 to 4,000 in 20 years. Let *t* be the number of years since the population was 16,000 and write an exponential formula for the population P(t) as a function of time.

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8. Find the following limits, if they exist.

(a)
$$\lim_{x\to 9} \frac{x^2 - 81}{3 - \sqrt{x}}$$

(b)
$$\lim_{x\to 3} \frac{x^2+9}{6-x}$$

(c)
$$\lim_{x \to \infty} \frac{6 - 8x^3}{x^3 + 1}$$

9. Find $\lim_{x\to 2} f(x)$ for the following function using left and right limits or explain why the limit does not exist (use correct notation).

$$f(x) = \begin{cases} 3x - 2, & x < 2\\ x^2 + 2, & x > 2 \end{cases}$$

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10. Use the definition of the derivative to find g'(x) if $g(x) = \frac{1}{3-x}$.

11. For each of the following, find $\frac{dy}{dx}$ (do not simplify your answers).

(a)
$$y = \frac{x^3 + \pi}{x - 11}$$

(b)
$$y = (x^3 - 5x)^4 (\sqrt{x} + 1)$$

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12. Find an equation of the tangent line to $y = 2x^3 - 5x$ at the point on the curve where x = 2.