Math 171 - Test 3a

November 18, 2010

Name _____

Score _____

Show all work. Supply explanations when necessary.

1. (4 points) Find the horizontal asymptote of the graph of R.

$$R(x) = \frac{5x^3 - 8}{3x^3 + 2x^2 - 8x + 7}$$

2. (4 points) Find the function f such that $f'(x) = 3x^5 - 4x + 2$ and $f(1) = 3$.

3. (3 points) Find the linearization of $g(x) = 3\sin 2x$ at $x = 0$.

4. (4 points) Evaluate the limit: $\lim_{x \to -\infty} \dfrac{2x^2 + 7x - 3}{5x^2 - x^5}$

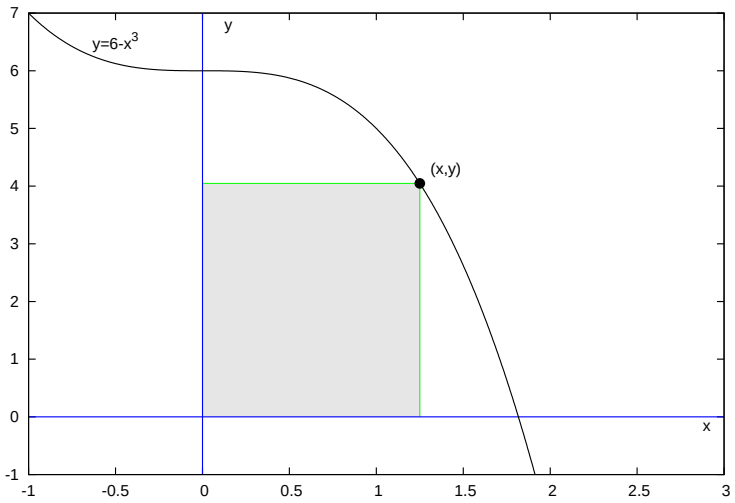
5. (4 points) What is the maximum number of horizontal asymptotes that a graph can have? Briefly explain your reasoning.

6. (8 points) Evaluate each indefinite integral.

   (a) $\displaystyle\int \left(\sqrt[5]{x^3} - 5x^2 + \frac{4}{x^3} \right) dx$

   (b) $\displaystyle\int (3\sec^2 t - \cos 7t)\, dt$

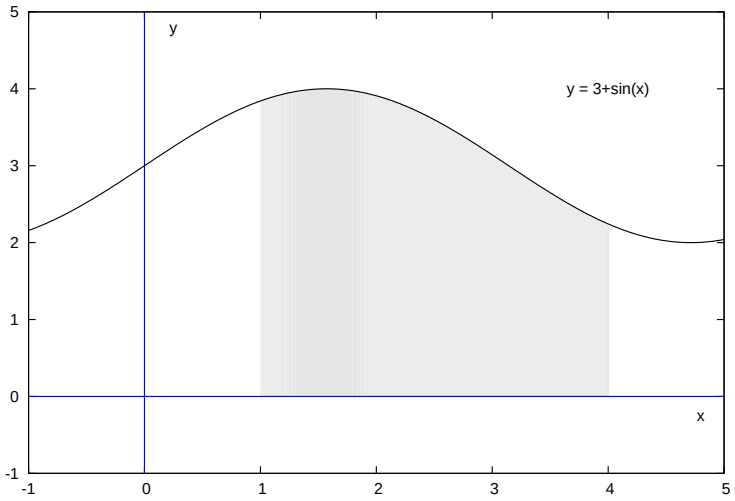
7. (12 points) A rectangle is inscribed in the first quadrant region below the graph of $y = 6 - x^3$ (see below). Find the coordinates of the point (x, y) that maximize the area of the rectangle.



8. (4 points) Some values of $f(x)$ and $f'(x)$ near $x = 1$ are given in the table below. Find the linearization of f at $x = 1$. Then use the linearization to approximate $f(0.75)$.

x	0.50	0.75	1.00	1.25	1.50
$f(x)$	6.08	6.90	8.00	9.41	11.14
$f'(x)$	2.74	3.82	5.00	6.26	7.60

9. (10 points) The graph of $f(x) = 3 + \sin x$ is shown below.



(a) Write the definite integral that gives the area of the shaded region.

(b) Use three subintervals of equal length and right subinterval endpoints to compute a Riemann sum that approximates the value of your definite integral.

(c) Sketch the rectangles associated with your Riemann sum on the graph above. Does your Riemann sum appear to under-estimate or over-estimate the exact value of the definite integral.

10. (5 points) Use Newton's method, starting with $x_0 = -1$, to approximate the solution of the equation $x = \cos x$. Which one of these numbers is closest to your value of x_2?

(a) 0.75

(b) 2.98

(c) 8.72

(d) -0.51

11. (4 points) Let $V = 6\cos(3w^2 + 5)$. Determine the differential dV.

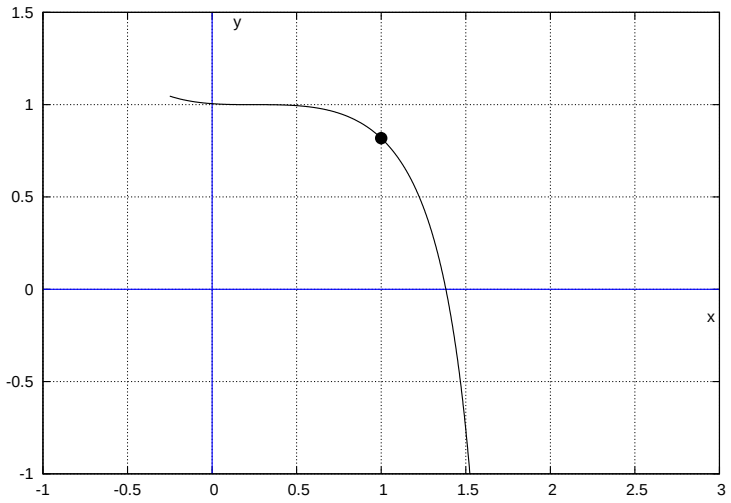
12. (3 points) The graph of $y = f(x)$ is shown below. Suppose you use Newton's method, starting with $x_0 = 1$, to approximate a solution of $f(x) = 0$. Which one of the following numbers would be closest to x_1?

(a) 1.9

(b) 1.35

(c) 2.5

(d) 1.0



13. (10 points) Use area to evaluate each definite integral.

(a) $\int_1^4 6\,dx$

(b) $\int_0^2 (8-3x)\,dx$

14. (5 points) Evaluate the limit: $\lim_{x\to\infty} \dfrac{3x}{\sqrt{2x^2+5}}$.

Math 171 - Test 3b

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Show all work. Supply explanations when necessary. YOU MUST WORK INDIVIDUALLY ON THIS EXAM.

1. (4 points) A right circular cylinder has height 4.75 m. Use differentials to estimate the change in volume if the radius changes from 3.2 m to 3.3 m. What is the corresponding percent change?

2. (6 points) Let $f(x) = 2^x$. Using 5 subintervals of equal length, compute a Riemann sum for $f(x)$ on $[0, 1]$. Sketch the graph along with your rectangles.

3. (10 points) Use algebra and calculus techniques to sketch the graph of $y = \frac{x^3}{3} - 3x$. Use graph paper! (This problem is open-ended on purpose. Be thorough enough to make your work worth 10 points. Graph paper is available at `http://www.printfreegraphpaper.com`.)