

Name _____ Rec. Instr. _____
 Signature _____ Rec. Time _____

Math 220
 Final Exam
 December 14, 2011

No books, calculators, or notes are allowed. Please make sure that your cell phone is turned off. You will have 110 minutes to complete the exam. Unless instructed otherwise, **show your work.**

Problem	Points	Points Possible	Problem	Points	Points Possible
1		18	8		5
2		5	9		16
3		5	10		6
4		4	11		6
5		3	12		8
6		8	13		8
7		8	Total Points		100

1. (3 points each) Evaluate the following:

A. $\lim_{x \rightarrow 2} \frac{x - 2}{x^2 - 3x + 2} =$

B. $\lim_{x \rightarrow \infty} (e^{-x} + 2) =$

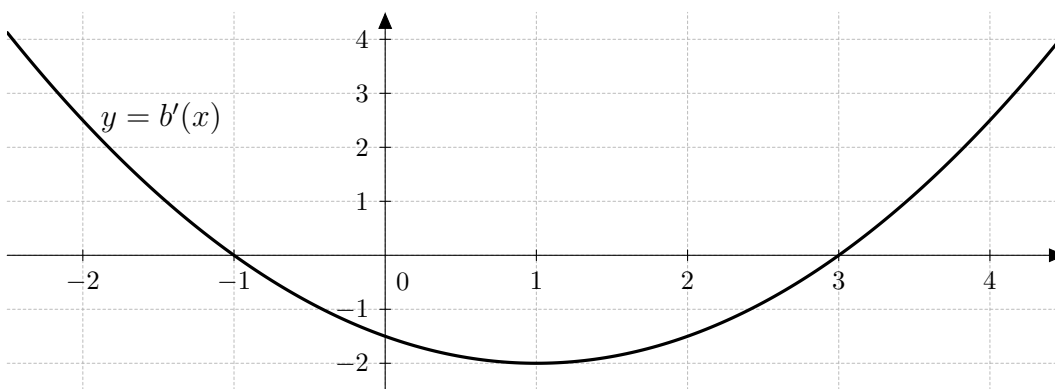
C. $\frac{d}{dx} \int_0^x \sin(t^4 + 1) dt =$

D. $\frac{d}{dx} \int_x^3 \cos(t) dt =$

E. $\frac{d}{dx} (x \cdot \sec(x^2)) =$

F. $\lim_{x \rightarrow -\infty} \frac{4x + 1}{\sqrt{4x^2 + 3}} =$

2. (5 points) Find the absolute maximum and absolute minimum of $w(x) = x^3 - 3x^2 + 2$ on $[1, 3]$.
3. (5 points) Using the limit definition of the derivative, find the derivative of $f(x) = \frac{1}{x}$.
4. (4 points) Use a linear approximation to estimate $\sqrt{4.1}$.
5. (3 points) Let $r(t)$ be the rate of growth of a puppy in pounds per week, where t denotes the number of weeks since the puppy's birth. What does $\int_5^{10} r(t) dt$ represent?



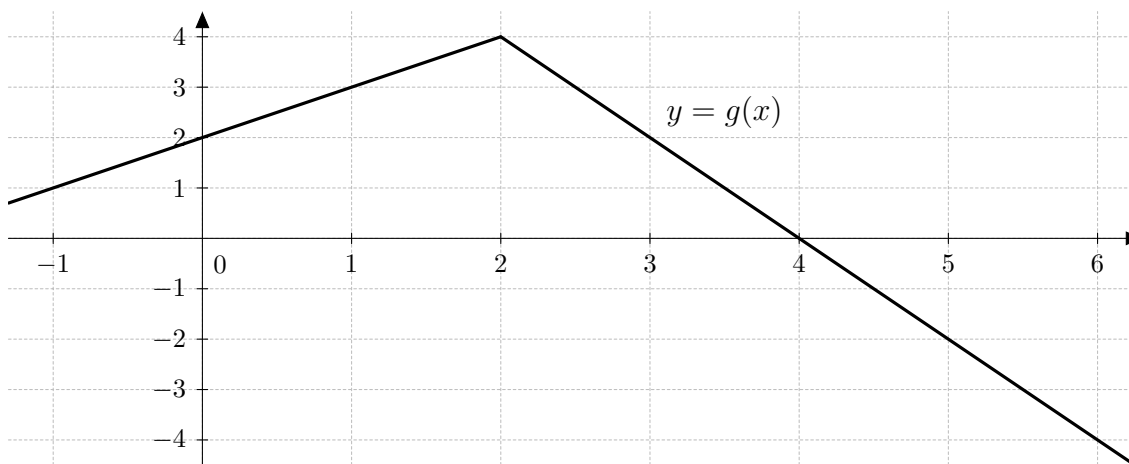
6. (2 points each) $y = b'(x)$ is plotted above. Find:

A. Interval(s) where $b(x)$ is increasing: _____ decreasing: _____

B. x -coordinate(s) where $b(x)$ has a local max: _____ local min: _____

C. Interval(s) where $b(x)$ is concave down: _____ concave up: _____

D. x -coordinate(s) where $b(x)$ has an inflection point: _____



7. (2 points each) $y = g(x)$ is plotted above. Evaluate the following:

A. $\int_{-1}^2 g(x) \, dx =$

B. $\int_2^4 g(x) \, dx =$

C. $\int_4^6 g(x) \, dx =$

D. $\int_{-1}^6 g(x) \, dx =$

8. (5 points) Suppose that an oil spill from a ruptured tanker spreads in a circular pattern. If the radius of the oil spill increases at a constant rate of 2 ft/sec, how fast is the area of the spill increasing when the radius is 10 ft?

9. (4 points each) Evaluate the following:

A. $\int_0^3 (x^2 + 2) dx$

B. $\int e^x \sec^2(e^x) dx$

C. $\int_0^4 \frac{dx}{\sqrt{2x+1}}$

D. $\int \frac{x^2}{\sqrt{x-1}} dx$

10. (6 points) Find the area bounded between $y = x^2$ and $y = 2 - x^2$.

11. (6 points) Find the volume of the solid obtained by rotating the region bounded by $y = x$ and $y = x^2$ around the x -axis.

12. (4 points each) Find $\frac{dy}{dx}$ for:

A. $x^2 - xy + y^3 = 9$

B. $y = x^{\cos(x)}$

13. (8 points) If 12 ft² of material is available to make a box with square base and open top, find the largest possible volume for the box. (Justify why your answer is an absolute maximum.)