

Name _____ Signature _____

Math 220 – Final Exam (Version E) – May 14, 2014

1. (7 points each) Find the following:

A. $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^2 + 6}}{3x + 5}$

B. $\int_0^2 x^2 e^{x^3} dx$

C. $\frac{dy}{dx}$ if $x^2 + 4y^2 = 3$

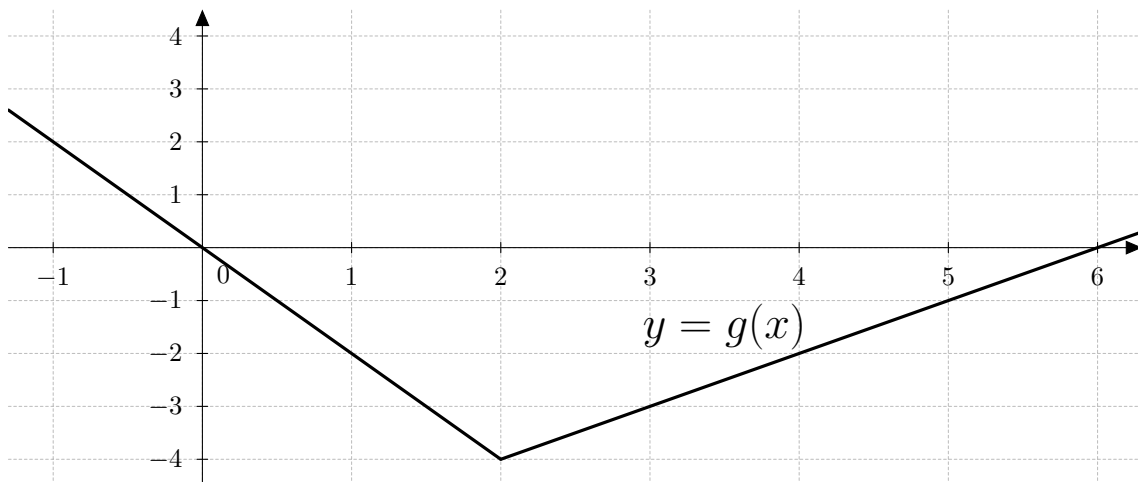
2. (7 points) Let $f(x) = \frac{1}{x}$. Using the limit definition of the derivative, find $f'(2)$.

3. (5 points each) Find the following:

A. $\frac{d}{dx} \cos(x^2 + 3x)$

B. $\frac{d}{dx} \left(\frac{2^x}{x^4 + x^2} \right)$

C. $\int_0^3 t^2 dt$



4. (3 points each) $y = g(x)$ is plotted above. Evaluate the following definite integrals. (No work needs to be shown.)

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

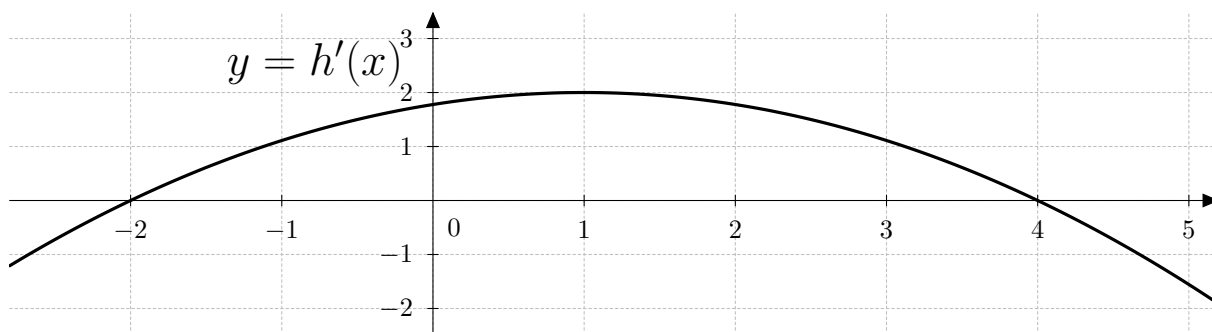
B. $\int_2^6 g(x) \, dx =$

5. (9 points) Find the area bounded between $y = x^4$ and $y = x$.

6. (6 points) Find the linearization of $k(x) = e^x$ at $x = 0$.
7. (10 points) A rectangular open-topped box is to have a square base and volume 8 ft^3 . If material for the base costs \$2 per ft^2 and material for the sides costs \$1 per ft^2 , what dimensions minimize the cost of the box? (Justify why your answer is an absolute minimum.)

8. (6 points) Find $\frac{d}{dx} \int_0^{x^2} \cos(t^3 + 1) dt$.

9. (9 points) Find the volume of the solid obtained by rotating the region bounded by $y = 0$, $x = 4$, and $y = x^2$ around the x -axis.



10. (1 point each) $y = h'(x)$ is plotted above. Find the following:

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

B. Interval(s) where $h(x)$ is decreasing: _____

C. x -coordinate(s) where $h(x)$ has a local max: _____

D. x -coordinate(s) where $h(x)$ has a local min: _____

E. Interval(s) where $h(x)$ is concave up: _____

F. Interval(s) where $h(x)$ is concave down: _____

G. x -coordinate(s) where $h(x)$ has an inflection point: _____

11. (4 points) Let $w(t)$ be the rate that oil flows out of a storage tank in gallons per minute at time t minutes after the tank ruptures. What does $\int_0^{100} w(t) dt$ represent?