Calculus 1
Final Exam Review 1

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Compute $\dfrac{d}{dy}\int_1^y \sin(3x+2)dx$.

a) $\sin(3y+2)$

b) $3\cos(3y+2)$

c) $3\sin(3y+2)$

d) $\cos(3y+2)$

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Compute $\dfrac{d}{dx}\int_1^{x^2} \ln(t+4)dt$.

a) $\ln(x^2+4)$

b) $\frac{2x}{x^2+4}$

c) $\frac{1}{x^2+4}$

d) $2x\ln(x^2+4)$

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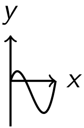
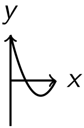
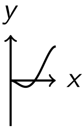
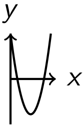
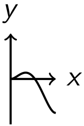
The graph of the function $f(x)$ is given below. Which of the following could be the graph of an antiderivative of $f(x)$?



a) 

c) 

b) 

d) 

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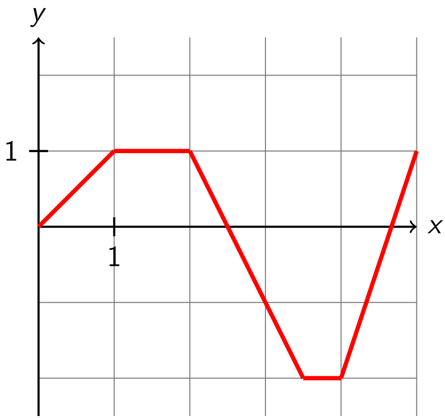
he graph of $f(x)$ is shown below. Use the graph to choose the **largest** quantity:



a) $\int_0^4 f(x)dx$

b) $\int_0^2 f(x)dx$

c) $\int_2^4 f(x)dx$

d) $\int_0^1 f(x)dx$

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Which of the following are true (Select All That Apply)?

a) If f is even, then $\int_{-a}^{a} f(x)dx = -\int_{-a}^{a} f(x)dx$.

b) If f is even, then $\int_{-a}^{a} f(x)dx = 2\int_{0}^{a} f(x)dx$.

c) If f is even, then $\int_{-a}^{a} f(x)dx = 2a$.

d) If g is odd, then $\int_{-a}^{a} g(x)dx = 0$

e) If g is odd, then $\int_{-a}^{a} g(x)dx = 2\int_{0}^{a} g(x)dx$

f) If g is odd, then $\int_{-a}^{a} g(x)dx = 2a$

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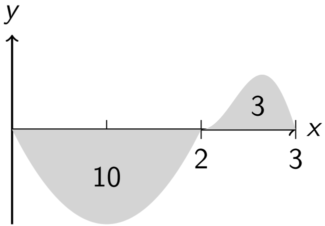
The graph of $f(x)$ is shown below and the areas of each shaded region are marked on the graph of $f(x)$ below. Evaluate $\int_0^3 f(x)dx$.



a) 13

b) -13

c) 7

d) -7

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Compute exactly $\int (2x + \frac{1}{x}) dx$.

a) $2 + \ln|x| + c$

b) $x^2 - \frac{1}{x^2} + c$

c) $x^2 + \ln|x| + c$

d) $2 - \frac{1}{x^2} + c$

L'Hopitals Rule

Find each of the following limits exactly. Be sure to justify your answers.

- $\lim\limits_{x \to 1} \frac{\ln(x)}{x^2-1}$
- $\lim\limits_{x \to \infty} \frac{e^x}{x^2}$
- $\lim\limits_{x \to \infty} xe^{-x}$

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(a) $\lim\limits_{x\to 1} \frac{\ln(x)}{x^2-1} \overset{0/0}{=} \lim\limits_{x\to 1} \frac{1/x}{2x} = \lim\limits_{x\to 1} \frac{1}{2x^2} = \frac{1}{2}$

(b) $\lim\limits_{x\to\infty} \frac{e^x}{x^2} \overset{\infty/\infty}{=} \lim\limits_{x\to\infty} \frac{e^x}{2x} \overset{\infty/\infty}{=} \lim\limits_{x\to\infty} \frac{e^x}{2} = \infty$ or DNE

(c) $\lim\limits_{x\to\infty} xe^{-x} = \lim\limits_{x\to\infty} \frac{x}{e^x} \overset{\infty/\infty}{=} \lim\limits_{x\to\infty} \frac{1}{e^x} = 0$

Parametric Equations

The position of a particle at time t is given by $x = t + 1$, $y = t^2 - 2$.

1. Find $\dfrac{dy}{dx}$ in terms of t.

2. Find the equation of the tangent line when $t = 1$.

Parametric Equations

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(b) Option 1: (standard equation)
$\frac{dy}{dx}|_{t=1} = 2$. At $t = 1$, we have the point $(2, -1)$. Plugging into $y = mx + b$ and solving for b (or using point-slope form), we get $y = 2x - 5$.
Option 2: (parametric equations)
$\frac{dy}{dt}|_{t=1} = 2$ and $\frac{dx}{dt}|_{t=1} = 1$. At $t = 1$, we have the point $(2, -1)$.
Thus the tangent line is given by the equations
$x = 2 + t, \quad y = -1 + 2t.$

Integrals

Use geometry to calculate each of the following integrals exactly. The graph of $f(x)$ is shown below.

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Integrals

A vehicle's velocity, in feet per second, t seconds after the start of a timer is given in the table below.

t	0	2	4	6
$v(t)$	20	30	35	37

a) You will be asked to estimate $\int_0^6 v(t)dt$ using a left-hand sum with 3 subdivisions. What is the most reasonable Δt you can choose?

b) Estimate $\int_0^6 v(t)dt$ using a left-hand sum with 3 subdivisions. To receive full points you must write out each term of the sum.

c) Is the left-hand sum approximation an over, under or exact estimate of the distance the vehicle traveled? Give a **concise** explanation of why this is true.

Integrals

Find an antiderivative of each of the following functions.

a) $f(x) = \sin(x) + e^x$

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

Differential Equations

An object's velocity is changing according to the differential equation $\frac{dv}{dt} = t + 1$ with initial value $v(0) = 2$. Find the formula for $v(t)$, the velocity of the object after t seconds.