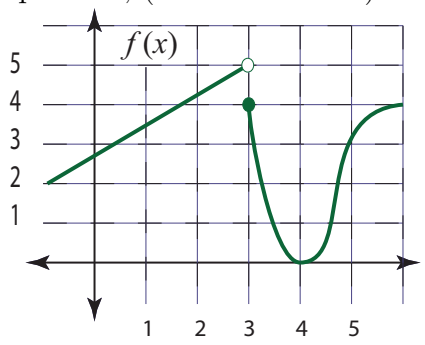
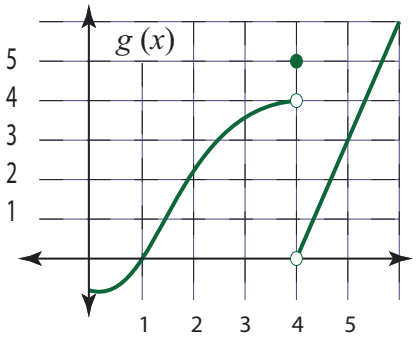
Calculus I. Test 3 (final) Review, answers.
Make sure you also study all the quizzes, old tests and old reviews!

1. Use the graphs shown for f and g to evaluate each function value or limit, or yes/no question, (or answer DNE).





a) $f(3) = ?$ 4

b) $g(4) = ?$ 5

c) $\lim_{x \to 3^+} f(x) = ?$ 4

d) $\lim_{x \to 3} f(x) = ?$ DNE

e) Is $f'(x) > 0$ for $x = 2$? yes

f) Is $f'(x) > 0$ for $4 < x < 5$? yes

g) Is $f'(x) < 0$ for $4 < x < 5$? no

h) Is there a c.p. at $g(4)$? yes Is there a c.p. at $f(4)$? yes

i) Is $f'(x) = DNE$ at $x = 3$? yes

j) Is $f(x)$ continuous at $x = 3$? no

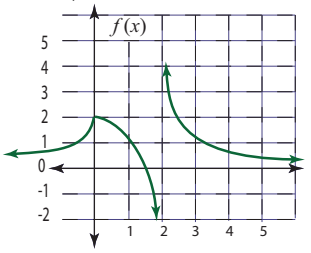
k) Is $f'(x) = DNE$ at $x = 1$? no

l) Is $f''(x) < 0$ at $3 < x < 4$? no

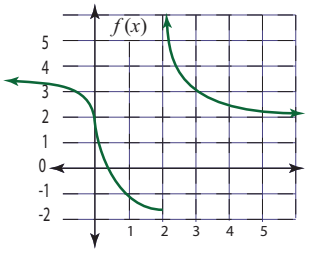
m) Is $f''(x) > 0$ at $x = 4$? yes

n) Is $g'(x) > 0$ for $1 < x < 3$? yes

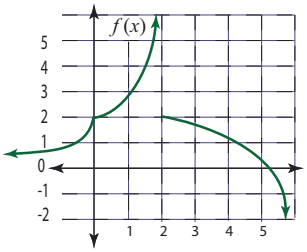
2. Use the graphs shown for f to evaluate each function value or limit, or question, (or answer DNE).



A.



B.



C.

a) In A, what are the two x-values where $f(x) = DNE$? 0 and 2

b) In A, which x-value is the point of inflection? $x = 0$

c) In B, which x-value is the point of inflection? $x = 0$

d) In A, what x-values have $y' < 0$ and $y'' > 0$? $2 < x < 6$

e) In C, what x-values have $f'(x) < 0$ and $f''(x) < 0$? $2 < x < 6$

f) In A, which x-values has a c.p.? $x = 0$

g) In C there is a vertical asymptote. State the equation of that v.a. $x = 2$

h) In B there is a horizontal asymptote as x goes to ∞. The equation of that h.a. $y = 2$

3. Find the length of one side of the maximum area rectangle made by using 50 ft of wire in the below circuit diagram 3. Find x, use the second derivative test to check for max.

$x = 25/12.$ $A''(25/12) = -24(8/7) < 0$

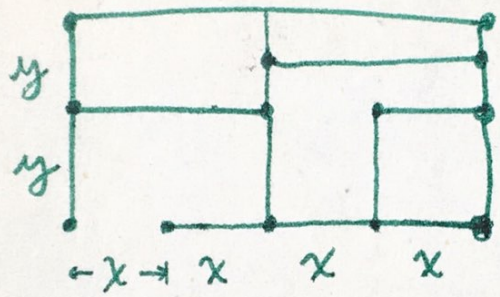
4. Find the minimum length of wire in the below circuit diagram 4, if the area of the rectangle is 10. Find x, use the second derivative test to check for min.

$x = \sqrt{80/81}$ $L'' = (160/9)x^{-3} > 0$ when $x = \sqrt{80/81}$

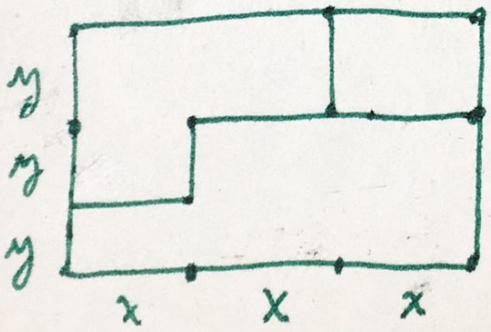
5. Find the radius of the maximum volume open-top cylindrical can that uses 5 square feet of tin. See picture and formula below.

radius is $r = \sqrt{\frac{5}{3\pi}}$

3.



4.



5)

$V = \pi r^2 h$

$S = 2\pi r h + \pi r^2$

6. Antiderivatives. 4

a) $\int (x^4 + \sin x)dx$

$\frac{x^5}{5} - \cos x + c$

b) $\int \left(\frac{\sqrt{x}+1}{x}\right) dx$

$2\sqrt{x} + \ln x + c$

c) $\int \left(\frac{2e^x + 1}{2}\right) dx$

$e^x + \frac{x}{2} + c$

d) $\int (3^x + 1)\, dx$

$x + \frac{3^x}{\ln 3} + c$

e) $\int \left(\cos x - \sec^2 x\right) dx$

$\sin x - \tan x + c$

7. Definite Integrals 5

a) Find the definite integral: $\int_0^{\pi} \sin x \cos^3 x dx$.

0

b) Find the area under the curve $y = x\sqrt{9 + x^2}$ from $x = 0$ to $x = 4$.

$\frac{98}{3}$

c) Find the area under the curve $y = 2^x\sqrt{8 + 2^x}$ from $x = 0$ to $x = 3$.

$\frac{74}{3 \ln 2}$

d) Find the definite integral: $\int_1^2 x\sqrt{x + 1}dx$.

$(-4/15)(\sqrt{2} - 6\sqrt{3}) = 2.3942$