

**MAC2311**  
**Ref. #: 829232**  
**Term: Spring 2015 (2014\_2)**  
**Final Exam**

Name \_\_\_\_\_

Grade \_\_\_\_\_

Student ID \_\_\_\_\_

Date \_\_\_\_\_

**SHORT ANSWER. Show ALL work NEATLY in the space provided, and write the final answer on the answer line. No credit will be given if work is not shown or is not legible.**

**Evaluate the integral.**

1)  $\int_2^7 \frac{2}{5} x \, dx$

1) \_\_\_\_\_

**Use implicit differentiation to find  $dy/dx$ .**

2)  $2xy - y^2 = 1$

2) \_\_\_\_\_

Evaluate the integral.

3)  $\int (7\csc x \cot x + 8 \csc^2 x) dx$

3) \_\_\_\_\_

Solve the problem.

4) An object is dropped from 65 ft above the surface of the moon. How long will it take the object to hit the surface of the moon if  $d^2s/dt^2 = -5.2 \text{ ft/sec}^2$ ?

4) \_\_\_\_\_

Use the substitution formula to evaluate the integral.

5)  $\int x^2 \sin(2x^3) dx$

5) \_\_\_\_\_

**Solve the problem.**

6) Find a curve  $y = f(x)$  with the following properties:

6) \_\_\_\_\_

i.  $\frac{d^2y}{dx^2} = 12x$

ii. The graph passes through the point  $(0,1)$  and has a horizontal tangent at that point.

**Evaluate the sum using algebra rules for finite sums and other formulas.**

7)  $\sum_{k=1}^{10} (k-2)$

7) \_\_\_\_\_

Use the substitution method to evaluate the integral.

8)  $\int \frac{dx}{x \ln x}$

8) \_\_\_\_\_

Solve the problem.

9) Find the area between the x-axis and the graph of  $f(x) = 4x^3 - 3x^2 + 2x$ , over  $-1 \leq x \leq 2$ .

9) \_\_\_\_\_

Solve the problem.

10) Find the points where the graph of the function have horizontal tangents.

$f(x) = x^3 - 45x$

10) \_\_\_\_\_

Use the formula  $f'(x) = \lim_{z \rightarrow x} \frac{f(z) - f(x)}{z - x}$  to find the derivative of the function.

11)  $f(x) = \frac{4}{x + 4}$

11) \_\_\_\_\_

**Solve the problem.**

12) The driver of a car traveling at 30 ft/sec suddenly applies the brakes. The position of the car is  $s = 30t - 3t^2$ ,  $t$  seconds after the driver applies the brakes. How many seconds after the driver applies the brakes does the car come to a stop?

12) \_\_\_\_\_

Find the derivative of  $y$  with respect to  $\theta$ .

13)  $y = \ln(\cos(\ln \theta))$

13) \_\_\_\_\_

Use a reference triangle in an appropriate quadrant to find the angle.

14)  $\tan^{-1} \left( \frac{\sqrt{3}}{3} \right)$

14) \_\_\_\_\_

Find the derivative of  $y$  with respect to the independent variable.

15)  $y = 7^{\ln 9t}$

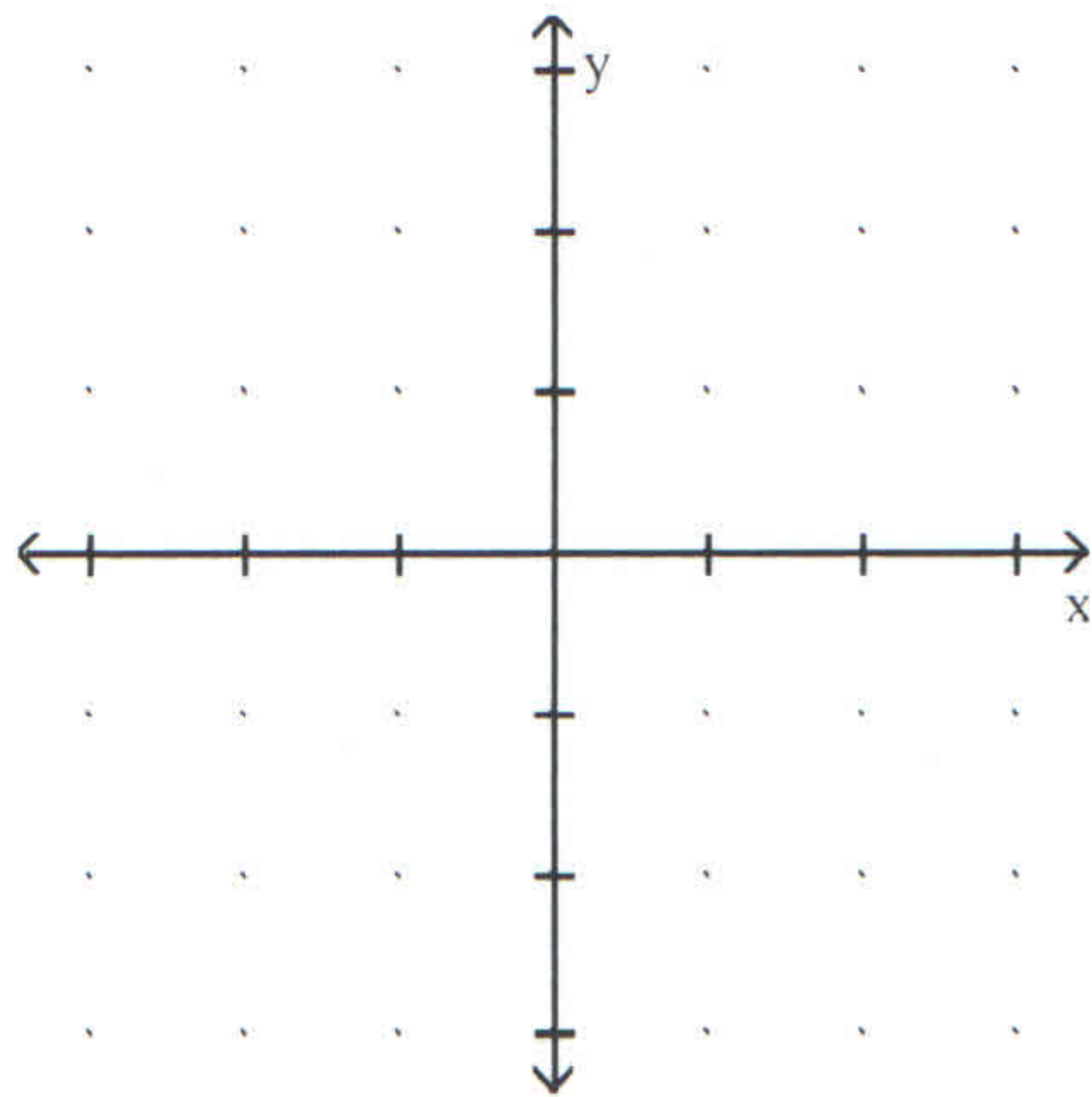
15) \_\_\_\_\_

Answer the questions below, then graph the function (10 points). Show all work and explain.

16)  $y = x^3 - 3x + 3$

16) \_\_\_\_\_

- a) Identify where the extrema of  $f$  occur
- b) Find the intervals where  $f$  is increasing or and where  $f$  is decreasing
- c) Find where the graph of  $f$  is concave up and where it is concave down
- d) Plot all specific points: local maxima and minima, points of inflection, and intercepts.
- e) Graph the equation



Evaluate the integral.

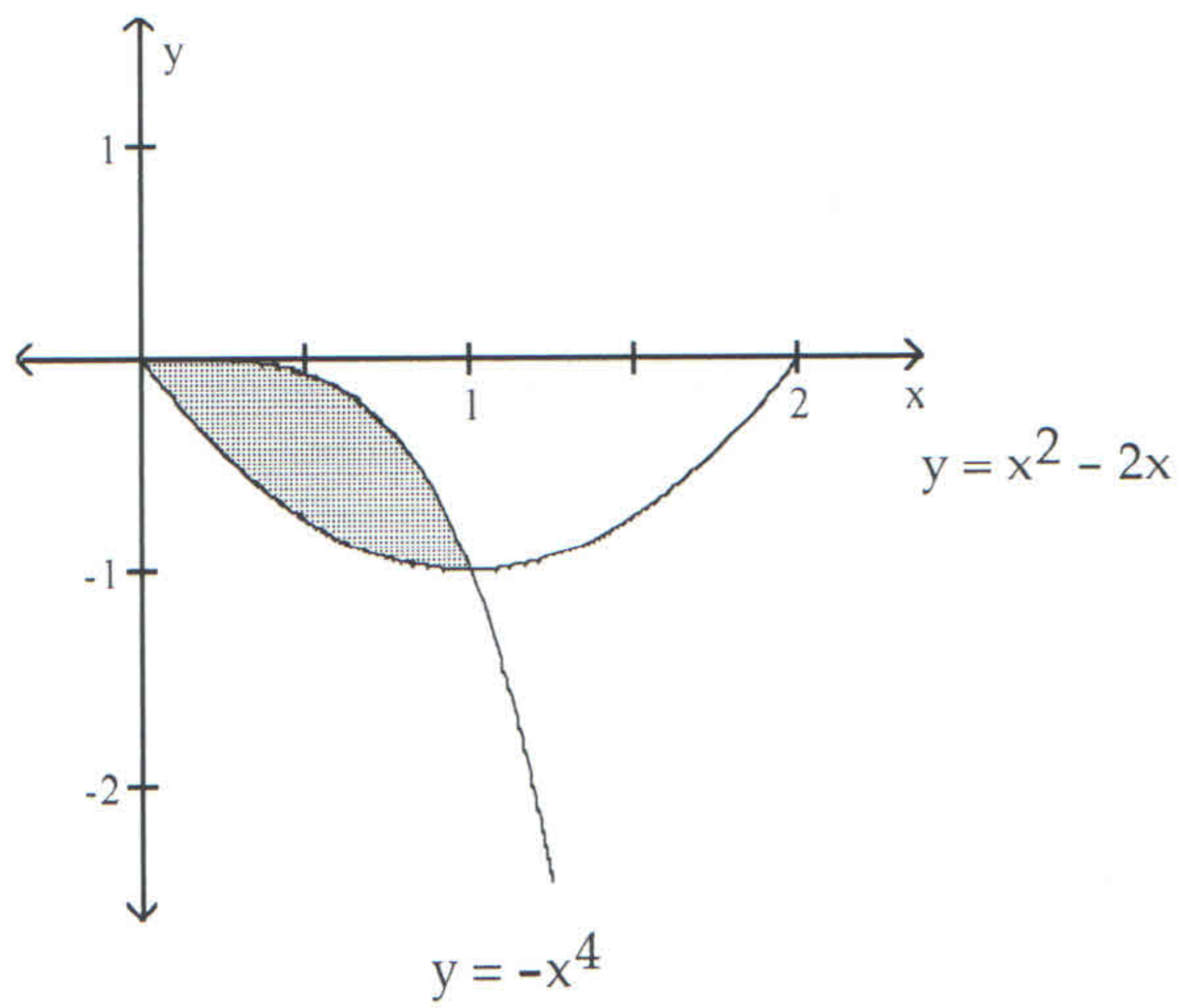
17)  $\int \frac{2}{16+4t^2} dt$

17) \_\_\_\_\_

Find the area of the shaded region.

18)

18) \_\_\_\_\_





At the given point, find the slope of the curve, the line that is tangent to the curve, or the line that is normal to the curve, as requested.

19)  $y^2 + x^2 = y + 2x$ , tangent at  $(0, 1)$

19) \_\_\_\_\_

Find the limit. Explain the method used and why.

20)  $\lim_{x \rightarrow \infty} \frac{\log_7(2x+1)}{\log_4(x-7)}$

20) \_\_\_\_\_

Evaluate the integral (Extra Credit - 5 points).

$$21) \int_0^{\ln 2} e^{2x} dx$$

21) \_\_\_\_\_

Answer Key

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1) 15

2)  $\frac{y}{y-x}$

3) 175

4) 2.40 sec

5) Yes

6)  $y = \frac{5}{6}x^3 + 1$

7)  $\cos 2\pi - \cos 4\pi + \cos 6\pi = 1$

8)  $\frac{1}{5} \ln(\ln x^5) + C$

9)  $s = \frac{1}{2}(3t^2 - 1)^4 - 13$

10)  $(-\sqrt{7}, 14\sqrt{7}), (\sqrt{7}, -14\sqrt{7})$

11)  $-\frac{4}{(x+4)^2}$

12) 5 sec

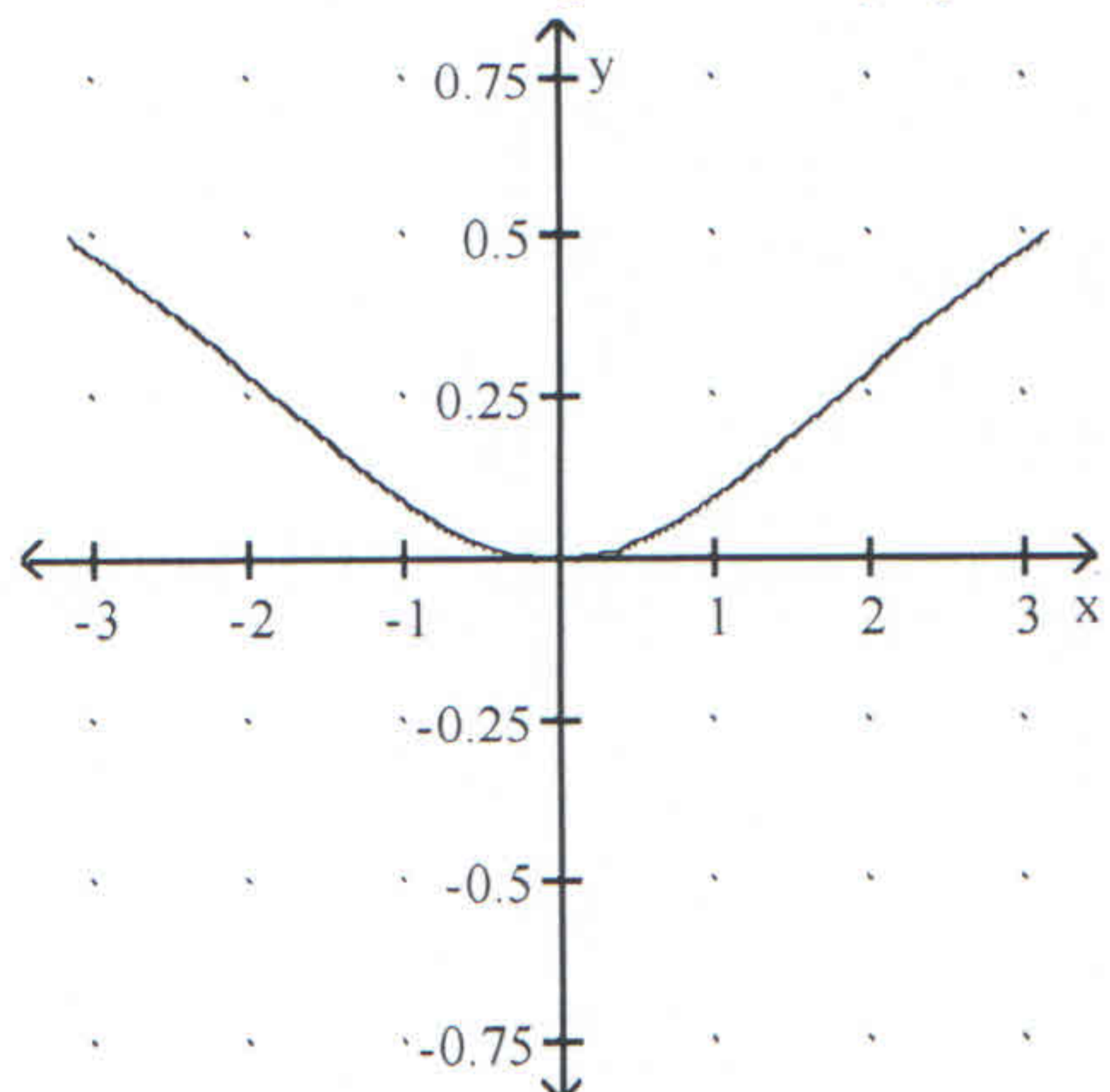
13)  $-\frac{\tan(\ln \theta)}{\theta}$

14)  $\frac{\pi}{4}$

15)  $\frac{\ln 7}{t} {}_7 \ln 9t$

16) local minimum:  $(0, 0)$

inflection points:  $\left(-\frac{\sqrt{30}}{3}, \frac{1}{4}\right), \left(\frac{\sqrt{30}}{3}, \frac{1}{4}\right)$



17)  $-\frac{\pi}{12}$

18)  $\frac{7}{15}$

19)  $y = 3x + 1$

20) 0

21)  $\frac{3}{2}$