MATH 150 FINAL EXAM, FALL 2012

NAME_____ **Instructor**_____. **Red ID**_____

No calculators allowed during the exam. One 3X5 notecard is allowed. Circle the correct answer on multiple choice questions. Show your work on short answer questions.

Part I: 56 points (14 @ 4)

1. $\lim_{x\to+\infty} \dfrac{\sqrt[5]{32x^5}}{4x}$

A) ½
B) 0
C) Does Not Exist
D) $-\infty$
E) ∞

2. Find $\dfrac{dy}{d\theta}$ for $y = \cos^4(\pi - 6\theta)$

A) $4\cos^3(\pi - 6\theta)$
B) $-24\cos^3(\pi - 6\theta)$
C) $-4\sin(\pi - 6\theta)\cos^3(\pi - 6\theta)$
D) $-24\sin(\pi - 6\theta)\cos^3(\pi - 6\theta)$
E) $24\sin(\pi - 6\theta)\cos^3(\pi - 6\theta)$

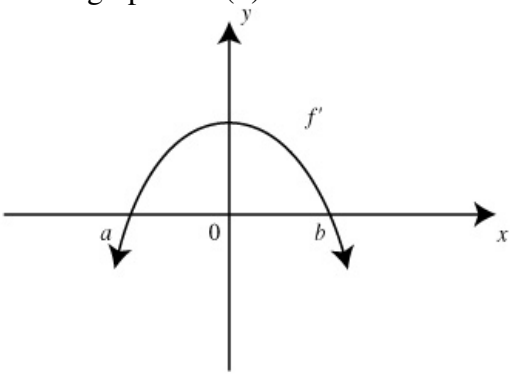
3. Find $\dfrac{dy}{dx}$ for $y = \ln(7x)$

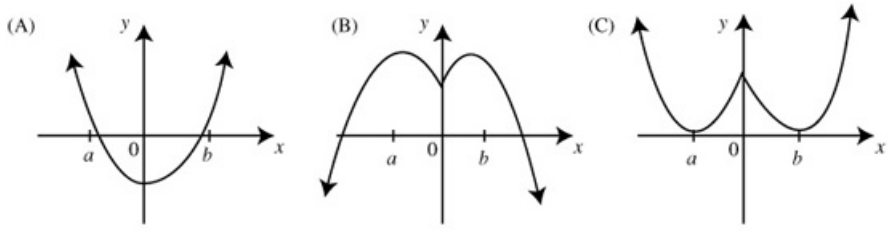
A) $\dfrac{x}{7}$
B) $\dfrac{1}{x}$
C) $\dfrac{7\ln(7x)}{x}$
D) $\dfrac{7}{x}$
E) $\dfrac{1}{7x}$

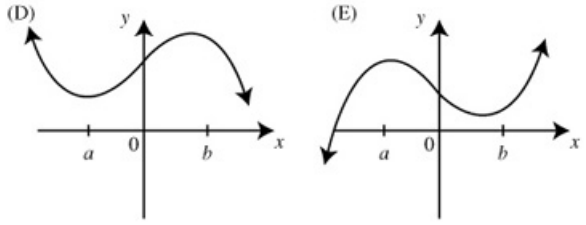
4. The function $f(x) = x^{1/3}$ has a point of inflection with an x coordinate of

A) 1
B) 0
C) $\frac{1}{3}$
D) $-\frac{1}{3}$
E) No inflection points exist for this function

5. The graph of f'(x) is shown. Which of the following is a possible graph for f(x)?

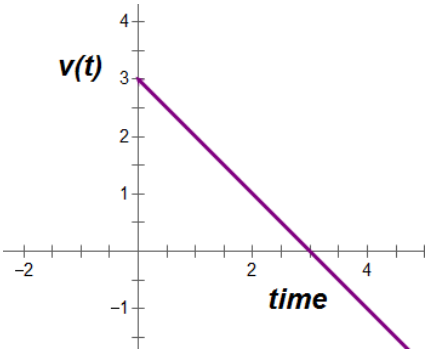






6. A graph of a moving object's velocity against time is shown. The acceleration of the object is which of the following?

A) Positive everywhere
B) Negative everywhere
C) Zero everywhere
D) Zero at some times, but not others
E) It cannot be determined from the given information



7. Let $f(x)=\dfrac{\sin x}{\sin(2x)}$. Find the equation of the line tangent to the function at $x=\dfrac{\pi}{4}$.

A) $y-\dfrac{\sqrt{2}}{2}=\dfrac{\sqrt{2}}{2}\left(x-\dfrac{\pi}{4}\right)$

B) $y-\dfrac{\sqrt{2}}{2}=-\dfrac{\sqrt{2}}{2}\left(x-\dfrac{\pi}{4}\right)$

C) $y-\dfrac{\sqrt{2}}{2}=\dfrac{\sqrt{2}}{4}\left(x-\dfrac{\pi}{4}\right)$

D) $y-\dfrac{\sqrt{2}}{2}=\dfrac{3\sqrt{2}}{2}\left(x-\dfrac{\pi}{4}\right)$

E) None of these

8. The distance, s (in feet), traveled by a particle moving in a straight line is given by the function $s(t)=t^2+t$ where t is measured in seconds. Find the average velocity for the time period from t = 1 to t = 4.

A) 5 $ft/_{\text{sec}}$

B) 6 $ft/_{\text{sec}}$

C) 9 $ft/_{\text{sec}}$

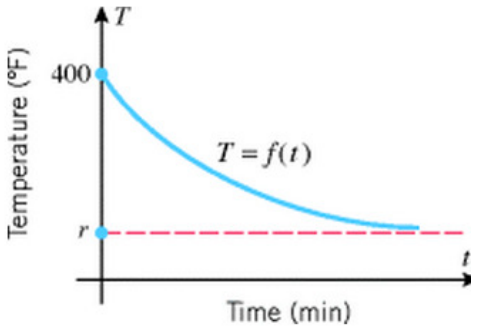
D) 10 $ft/_{\text{sec}}$

E) 11 $ft/_{\text{sec}}$

9. Let $T=f(t)$ denote the temperature of a baked potato t minutes after it has been removed from a hot oven. The accompanying figure shows the temperature versus time curve for the potato, where r is the temperature of the room.

Which of the following is indicated by the graph?

A) Potatoes cool at a constant rate
B) Potatoes cool at an increasing rate
C) Potatoes cool at a decreasing rate
D) Potatoes cool at a rate proportional to room temperature
E) None of these



10. A rock is thrown up from the surface of the moon at time t = 0 and its height above the moon's surface is given by $h(t) = \frac{-8t^2}{3} + 16t$ feet after t seconds. What is the highest elevation of the rock attained above the moon?

A) 16 feet
B) 22 feet
C) 24 feet
D) 27 feet
E) 32 feet

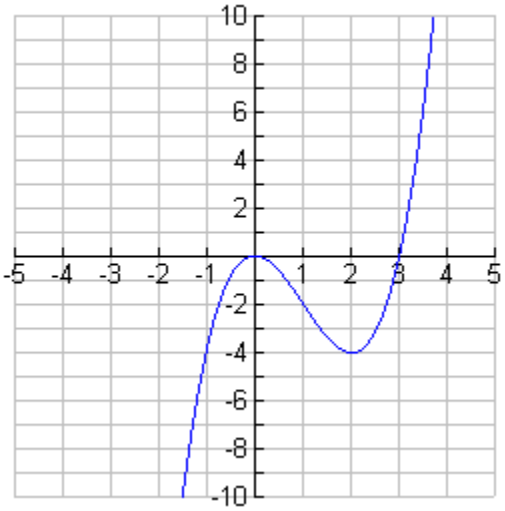
11. Given the function $f(x) = \begin{cases} (4x+3)^3 - 5x & \text{if } x \le 0 \\ 3x - 8 & x > 0 \end{cases}$, determine the slope of the function at x = -1

A) Does Not Exist
B) -5
C) 4
D) -6
E) 7
F) None of these is correct

12. Given the function $f(x) = (x+1)e^{5x}$, find the derivative of the function at x = 0.

A) 1
B) 5
C) 6
D) e^5
E) $1 + e^5$

For the next two questions, refer to the graph of the polynomial function below.



13. At what values of x is $f''(x) = 0$

A) x = 1
B) x = 2
C) x = 0 and x = 2
D) x = -1
E) x = 0 and x = 3
F) x = -1 and x = 1

14. Over what interval of x is the second derivative positive?

A) $(-\infty, \infty)$
B) $(-\infty, 0)$
C) $(-\infty, 1)$
D) $(-\infty, 3)$
E) $(1, \infty)$

Part II: Short answer

15. Over what interval of x is the function $f(x) = x(2x-4)^2 + 3$ decreasing?

Answer: [8 pts]

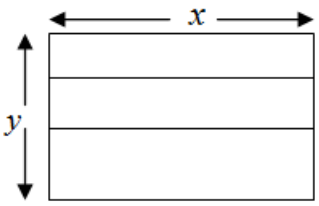
16. Evaluate the integral $\int_1^8 \left(\frac{4}{3}\sqrt[3]{x} + 1\right) dx$

Answer: [8 pts]

17. Evaluate the following integral: $\int \frac{\cos(2x)}{1+3\sin(2x)} dx$

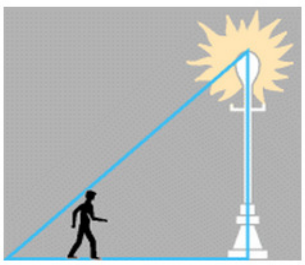
Answer: [8 pts]

18. A farmer wants the total area $(A = xy)$ of a rectangular garden to be 1000 square yards. The garden will have fencing around the edges, as well as two dividing fences as shown. What should the horizontal dimension, x, be in order to minimize the total length of fencing material needed? Justify that your answer is the absolute minimum value of the total length function. [10 pts]



Answer:

19. A four foot tall child is running at a rate of 6 ft/sec toward a streetlight that is 12 feet high. How fast is the length of the child's shadow changing? (note: include units to earn full credit) [10 pts]



Answer: