Practice Exam 3

1. Evaluate the limit

$$\lim_{x\to 0^+}\frac{\ln x}{2+3\ln(\sin x)}$$

A) 0 E) e^2
B) $\frac{2}{3}$ F) $\frac{1}{3}$
C) 3 G) does not exist
D) 1 H) ∞

2. Evaluate the limit

$$\lim_{x\to e^+}(\ln x)^{\frac{1}{x-e}}$$

A) 0 E) e^2
B) 1 F) $\frac{1}{e}$
C) 2 G) $\frac{1}{e^2}$
D) e H) $e^{1/e}$

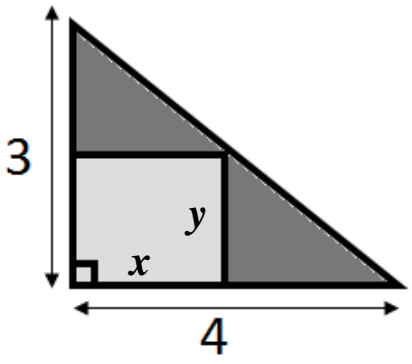
3. Let

$$f''(x)=15\sqrt{x}+\frac{3}{\sqrt{x}}$$

with $f'(1)=8$ and $f(1)=0$. Find $f(4)$.

A) 32 E) 116
B) 64 F) 124
C) 72 G) 128
D) 92 H) 192

4. Find the maximum area of the rectangle that can be inscribed in the right triangle with legs of length 3 and 4. Prove that you have found the abs. maximum for full credit.
Hint: Use similar triangles.



A) $\frac{9}{2}$ E) $\frac{7}{2}$
B) 3 F) $\frac{5}{2}$
C) 4 G) $\frac{11}{2}$
D) 5 H) 6

5. Estimate the area under the graph of the function $f(x)=16-x^2$ between $x=0$ and $x=4$ using 4 left endpoint rectangles. This estimate is how much larger than the actual area.

A) $\frac{8}{3}$ E) $\frac{28}{3}$
B) $\frac{16}{3}$ F) $\frac{22}{3}$
C) $\frac{20}{3}$ G) $\frac{32}{3}$
D) $\frac{26}{3}$ H) $\frac{50}{3}$

6. Let $g(x)=\int_{1/2}^{\sqrt{x}} \tan\left(t^2\right) dt$

Find $g'\left(\frac{\pi}{3}\right)$

A) $\sqrt{\frac{\pi}{3}}$ E) $\frac{1}{2\sqrt{\pi}}$
B) $\sqrt{3}$ F) $\sqrt{3}\pi^2$
C) $\frac{1}{\sqrt{3}}$ G) $\frac{\sqrt{3}}{\pi}$
D) $\frac{3}{2\sqrt{\pi}}$ H) $\frac{1}{2\pi}$

7. Let $L=\int_{\sqrt{e}}^{e^2} \frac{2}{x} dx$ and $M=\int_{0}^{3\ln 2} e^x dx$

find $L+M$.

A) 0 E) 6
B) 1 F) 7
C) 2 G) 8
D) 3 H) 10

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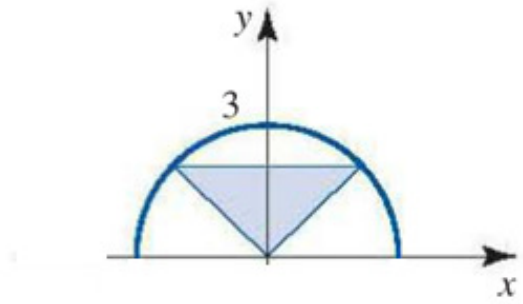
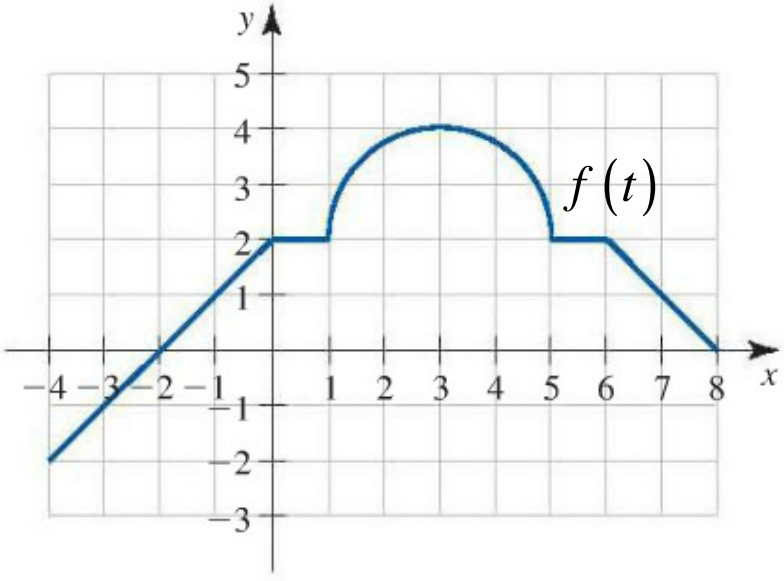
8. Find the maximum area of the triangle depicted below that can be inscribed in the semicircle of radius 3.
Prove that you have found the abs. maximum for full credit.



9. Let $g(x)=\int_{-4}^{x} f(t)\,dt$



a) Find the value of $g(8)$.

b) Find the value(s) of x that make $g'(x)=1$.

c) For what value(s) of x is $g''(x)=0$.

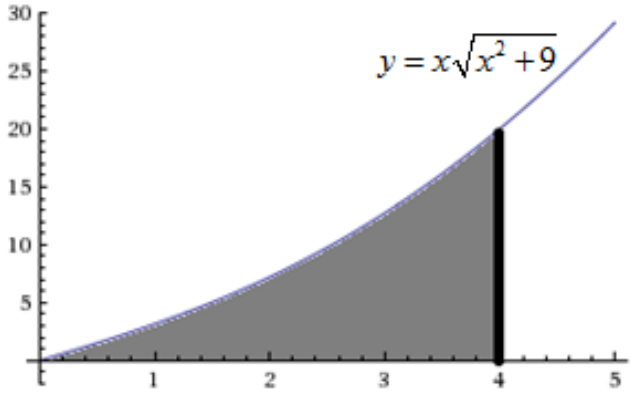
10. Let

$$f(x)=\begin{cases}12-x^2 & \text{for } x\le 2\\ x^3 & \text{for } x>2\end{cases}$$

Calculate $\int_{-1}^{4} f(x)\,dx$

a) 144 b) 126 c) 93 d) 63 e) 30 f) 20 g) 5 h) 2

11. Find the area of the shaded region.



A) $\frac{62}{3}$ B) $\frac{68}{3}$ C) $\frac{71}{3}$ D) $\frac{74}{3}$
E) $\frac{82}{3}$ F) $\frac{86}{3}$ G) $\frac{95}{3}$ H) $\frac{98}{3}$

12. Let

$$a=\int_{1}^{4}\frac{1}{\sqrt{x^3}}\,dx$$

and

$$b=\int_{0}^{\frac{2\pi}{9}}\sin(6x)\,dx$$

Find the value of $a+b$.

A) 7 E) $\frac{7}{12}$
B) $\frac{7}{3}$ F) $\frac{13}{2}$
C) $\frac{5}{4}$ G) $\frac{35}{12}$
D) $\frac{7}{6}$ H) $\frac{7}{2}$

Answers:
1. F
2. H
3. G
4. B
5. F
6. D
7. H
8. 9/2
9. a) $14+2\pi$ **b) -1, 7**
c) (0,1), (5,6) and x=3
10. C
11. H
12. C