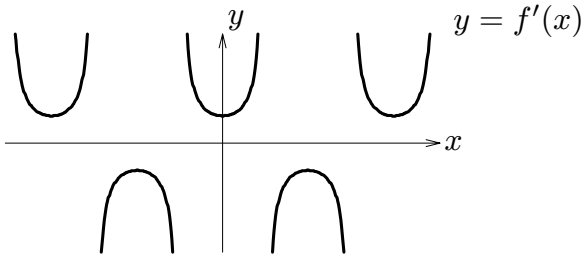
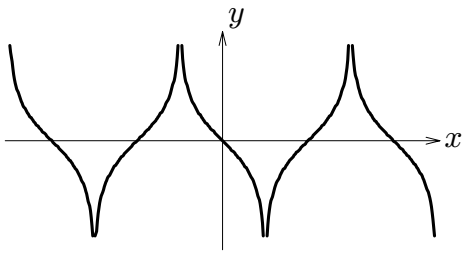
1. Given the graph of $y = f'(x)$, choose which graph could represent the graph of $y = f(x)$.



A.



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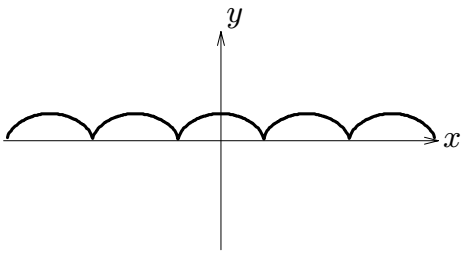
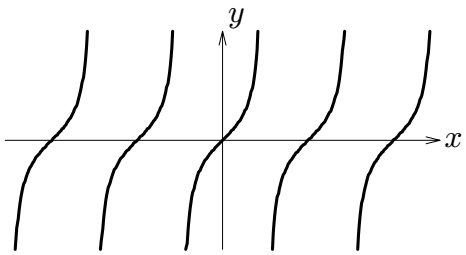
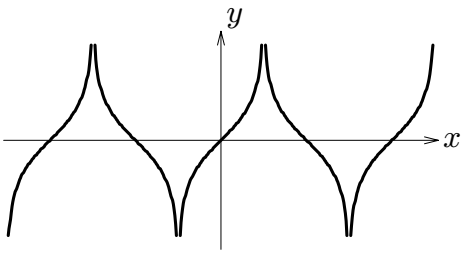


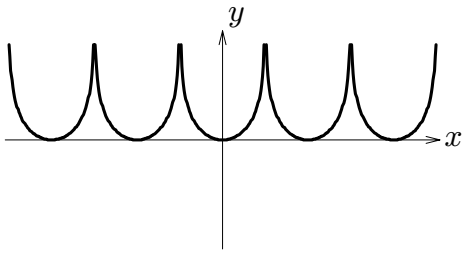
C.



D.



E.



2. At how many different values of x does the curve $y = x^5 + 2x$ have a tangent line parallel to the line $y = x$.

A. 0

B. 1

C. 2

D. 3

E. 4

3. Given the table

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	1	-1	2	-2
1	1	2	3	4
2	-4	-3	-2	-1
3	2	4	3	0

find $\dfrac{d}{dx}\left(\dfrac{f(x)}{f(x)+g(x)}\right)$ when $x = 1$.

A. 0

B. $\dfrac{1}{8}$

C. $\dfrac{1}{2}$

D. $\dfrac{14}{16}$

E. -2

4. If $f(x) = \tan^{-1} x$ then $f'(2) =$

A. $\frac{1}{5}$

B. $\frac{1}{3}$

C. $\frac{1}{\sqrt{5}}$

D. $\frac{1}{\sqrt{3}}$

E. $f'(2)$ does not exist.

5. If $f(x) = \pi^x$ then $f'(x) =$

A. π^x

B. $\pi^x \ln x$

C. $e^{x \ln \pi}$

D. $\pi^x \ln \pi$

E. $\pi^{\ln x}$

6. If $F(x) = g(x^2)$ then $F''(x) =$

A. $2x^2 g''(x) + 2(g(x))^2$

B. $g''(2x)$

C. $2xg''(x^2)$

D. $4xg''(x) + g'(x^2)$

E. $4x^2 g''(x^2) + 2g'(x^2)$

7. If $f(x) = e^x \tan x$ then $f'\left(\frac{\pi}{4}\right) =$

A. $-2e^{\pi/4}$
B. $3e^{\pi/4}$
C. $e^{\pi/4}$
D. $2e^{\pi/4}$
E. $-e^{\pi/4}$

8. If $f(x) = \ln(e^{x^2} + 1)$ then $f'(1) =$

A. $\dfrac{2e+1}{e+1}$
B. $\dfrac{1}{e+1}$
C. $\dfrac{e}{e+1}$
D. $\dfrac{2e}{e+1}$
E. $\dfrac{1}{(e+1)^2}$

9. If $x \sin y = y \cos x$ then the value of $\dfrac{dy}{dx}$ when $x = \dfrac{\pi}{4}$, $y = \dfrac{\pi}{4}$ is

A. $\dfrac{1-\pi/4}{1+\pi/4}$
B. -1
C. 0
D. 1
E. $\dfrac{1+\pi/4}{1-\pi/4}$

10. A radio-active isotope has a half-life of 103 years. How long in years will it take for $\frac{9}{10}$ of a sample of 7 grams to decay?

A. $103(\ln 10 - \ln 9)$

B. $\ln 103 - \ln 7$

C. $\dfrac{\ln 103}{\ln(9/10)}$

D. $7(\ln 10 - \ln 2)$

E. $\dfrac{103 \ln 10}{\ln 2}$

11. The height of a particle is given by

$$h(t) = 4t^3 - 9t^2 + 6t + 2, \qquad t \geq 0.$$

When is the particle moving in the downward direction?

A. $\frac{1}{2} < t < 1$

B. $1 < t$

C. $0 < t < \frac{1}{2}$

D. $0 < t < \frac{1}{2}$ and $1 < t$

E. It never moves in the downward direction

12. If $f(x) = e^{-3x} + x^{17} + 1$ then $f^{(20)}(0) =$

A. $3^{20} + 17!$

B. -3^{20}

C. 3^{20}

D. 1

E. -1

13. The width of a rectangle is increasing at 3 feet per second and its length is decreasing at 2 feet per second. When the width is 12 and its length is 8 what is the rate of change of the area of the rectangle?

A. 20

B. 52

C. -16

D. -84

E. 0

14. Sue leaves the bell-tower at 9:00 am heading north at 2 meters per second. John leaves the bell-tower one second later heading east also at 2 meters per second. How fast in meters per second is the distance between Sue and John increasing 3 seconds after John left?

A. 4

B. 3.6

C. 3.2

D. 2.8

E. 2.4