1. Find the domain D of $f(x) = \dfrac{x-2}{x^2+x-6}$.

A. $D = (-\infty, 2) \cup (2, \infty)$

B. $D = (-\infty, -3) \cup (-3, \infty)$

C. $D = (-\infty, -3) \cup (2, \infty)$

√D. $D = (-\infty, -3) \cup (-3, 2) \cup (2, \infty)$

E. $D = (-3, 2)$

2. Given $g(x) = \dfrac{4}{x}$, then $\dfrac{g(x+h) - g(x)}{h} =$

A. $\dfrac{-4}{x^2}$

B. $\dfrac{4}{x+h} - \dfrac{4}{x}$

C. $\dfrac{-4}{(x+h)^2}$

√D. $\dfrac{-4}{x(x+h)}$

E. $\dfrac{4}{x(x+h)}$

3. $\lim_{x \to 4} \frac{x-4}{\sqrt{x}-2} =$

A. $Doesn't \quad exist$
B. 0
C. 2
√D. 4
E. 1

4. Given distance function $s(t) = 3t - \cos t$, where s is in millimeters and t is in seconds, find the acceleration function $a(t)$.

A. $a(t) = 3 + \cos t$
B. $a(t) = 3 + \sin t$
C. $a(t) = \sin t$
D. $a(t) = -\cos t$
√E. $a(t) = \cos t$

5. The derivative of $\frac{x^2+5}{x+1}$ is

A. $\frac{x^2-2x-5}{(x+1)^2}$

B. $\frac{3x^2+2x+6}{(x+1)^2}$

√C. $\frac{x^2+2x-5}{(x+1)^2}$

D. $\frac{-x^2-2x+5}{(x+1)^2}$

E. $\frac{-3x^2-2x-6}{(x+1)^2}$

6. Find the $x-coordinate$ only of any points where the slope of tangent lines to the graph of $f(x)=(x^2-8)(x+3)$ is 1 .

A. $x=-3, \quad x=3$

B. $x=-1, \quad x=0, \quad x=3$

√C. $x=1, \quad x=-3$

D. $x=3, \quad x=-1$

E. $x=1, \quad x=0, \quad x=-3$

7. What is the slope of the tangent line to the graph $y = (\frac{2x}{x-1})^3$ at the point $(2, \quad 64)$?

A. 64
B. 48
C. -48
√D. -96
E. 96

8. Given $g(x) = \sqrt{2x+1}$, find out $g''(4) =$

A. 3
B. $\frac{1}{3}$
C. $\frac{-1}{54}$
√D. $\frac{-1}{27}$
E. $\frac{-1}{108}$

9. $\lim_{x\to\infty} \frac{3x^2 + x - 1}{1 + 2x - 4x^3} =$

A. *Doesn't exist*
B. $\frac{1}{4}$
C. 3
√D. 0
E. $-\frac{3}{4}$

10. Given $f(x) = x^4 - 4x^2$, please choose the correct statement about its relative Max/Min.
A. f has relative max at $x = \pm\sqrt{2}$, a relative min at $x = 0$.
√B. f has a relative max at $x = 0$, relative min at $x = \pm\sqrt{2}$.
C. f has a relative max at $x = \sqrt{2}$, a relative min at $x = -\sqrt{2}$.
D. f has a relative max at $x = -\sqrt{2}$, a relative min at $x = \sqrt{2}$.
E. f has no relative max, but has relative min at $x = \pm\sqrt{2}$.

11. If $g(x)=x+\frac{4}{x}$, then on the closed interval $[1, \quad 3]$,

A. g has an absolute max at $x=1$,and an absolute min at $x=3$.
B. g has an absolute max at $x=2$,and an absolute min at $x=3$.
√C. g has an absolute max at $x=1$,and an absolute min at $x=2$.
D. g has an absolute max at $x=2$,and an absolute min at $x=1$.
E. g has an absolute max at $x=3$,and an absolute min at $x=1$.

12. A container company is designing an open-top, square-based, rectangular box that will have a volume of $32 \; in^3$. What is the minimum surface area of this box?

A. $32 \; in^2$
√B. $48 \; in^2$
C. $64 \; in^2$
D. $24 \; in^2$
E. $56 \; in^2$

13. Approximate $\sqrt{3.95}$ by using linearization. Round your answer to 4 decimal places.

√A. 1.9875
B. 1.9906
C. 1.9938
D. 1.9972
E. 1.9998

14. Find an equation of tangent line to the curve $xy^2 + 3xy = 4$ at the point $(1, \quad 1)$.

A. $4x - 5y = -1$
√B. $4x + 5y = 9$
C. $5x + 4y = 9$
D. $5x - 4y = 1$
E. $x + y = 2$

15. In calm waters oil spilling from the ruptured hull of a grounded tanker spreads in all directions. If the area polluted is a circle and is increasing at a rate of $200\pi \quad ft^2/\sec$, determine how fast the radius is increasing when the radius of the circle is $20\,ft$.

A. $\frac{1}{2}\,ft/\sec$

B. $2\,ft/\sec$

√C. $5\,ft/\sec$

D. $10\,ft/\sec$

E. $0\,ft/\sec$

16. What is the derivative of $2x^2e^{-x}$?

A. $4xe^{-x}$

B. $-2x^2e^{-x}$

C. $2x(x+2)e^{-x}$

√D. $2x(2-x)e^{-x}$

E. $-2x^2e^{-x-1}$

17. What is the derivative of $\frac{\ln x + 1}{x}$?

A. $\frac{1}{x^2}$

B. $\frac{\ln x + 1}{x^2}$

√C. $\frac{-\ln x}{x^2}$

D. $\frac{1 - \ln x}{x^2}$

E. $\frac{\ln x + 2}{x^2}$

18. The population of fish in the lake after time t, in months, is given by $P(t) = \frac{1000}{1 + 2e^{-0.5t}}$, what is the rate of change of $P(t)$ at 4 months? Choose the closest answer.

A. $168\,/\,month$

B. $-168\,/\,month$

√C. $84\,/\,month$

D. $-84\,/\,month$

E. $787\,/\,month$

19. A sample of $E.coli$ is growing exponentially at $40^\circ c$, represented by $P(t) = 1000e^{0.033t}$, where t is measured in minutes. What is the generation time? Choose the closest answer.

A. $693\,\text{min}$
B. $1000\,\text{min}$
√C. $21\,\text{min}$
D. $42\,\text{min}$
E. $63\,\text{min}$

20. $\int 2e^{-3x}dx = ?$

A. $-6e^{-3x} + c$
B. $-6e^{-3x-1} + c$
√C. $\frac{-2}{3}e^{-3x} + c$
D. $\frac{2}{3}e^{-3x} + c$
E. $\frac{-2}{3}e^{-3x-1} + c$

21. Suppose that the acceleration function $a(t) = -6t + 3$, the initial velocity is $v(0) = 10$,and the initial position $s(0) = 20$. Find the distance function $s(t)$.

A. $s(t) = -t^3 + \frac{3}{2}t^2 + 10t$

B. $s(t) = -3t^2 + 3t + 20$

C. $s(t) = -t^3 + \frac{3}{2}t^2 + 10$

D. $s(t) = -t^3 + \frac{3}{2}t^2 + 20$

√E. $s(t) = -t^3 + \frac{3}{2}t^2 + 10t + 20$

22. Evaluate $\int_1^e (x + \frac{1}{x})dx$

A. $\frac{e^2}{2} + 1$

B. $\frac{1}{e} + e$

√C. $\frac{e^2}{2} + \frac{1}{2}$

D. $\frac{e^2}{2} + \frac{3}{2}$

E. $e^2 + 1$

23. Find the area under the graph $f(x) = 2\cos 3x$ over the interval $[-\frac{\pi}{6}, \ \frac{\pi}{6}]$.

A. 0
B. $\frac{2}{3}$
√C. $\frac{4}{3}$
D. 4
E. 8

24. Find the area of the region bounded by $y = x$ and $y = x^4$.

A. $\frac{7}{10}$
B. $\frac{1}{10}$
√C. $\frac{3}{10}$
D. $-\frac{1}{10}$
E. $-\frac{3}{10}$

25. A city grows at a rate of $156t+1000$ people per year, where t is time in years after the beginning of 2002. Given that the population at the beginning of 2002 is 13210. What is the population at the beginning of 2007 ?

No solution here.

A. 18210
B. 14990
C. 16410
D. 20410
E. 26420