3. The slope of the line tangent to the graph of $y=\ln\left(x^2\right)$ at $x=e^2$ is

(A) $\frac{1}{e^2}$ (B) $\frac{2}{e^2}$ (C) $\frac{4}{e^2}$ (D) $\frac{1}{e^4}$ (E) $\frac{4}{e^4}$

4. If $f(x)=x+\sin x$, then $f'(x)=$

(A) $1+\cos x$ (B) $1-\cos x$ (C) $\cos x$

(D) $\sin x-x\cos x$ (E) $\sin x+x\cos x$

6. If $f(x)=\frac{x-1}{x+1}$ for all $x\neq -1$, then $f'(1)=$

(A) -1 (B) $-\frac{1}{2}$ (C) 0 (D) $\frac{1}{2}$ (E) 1

8. A particle moves in a straight line with velocity $v(t)=t^2$. How far does the particle move between times $t=1$ and $t=2$?

(A) $\frac{1}{3}$ (B) $\frac{7}{3}$ (C) 3 (D) 7 (E) 8

9. If $y=\cos^2 3x$, then $\frac{dy}{dx}=$

(A) $-6\sin 3x\cos 3x$ (B) $-2\cos 3x$ (C) $2\cos 3x$

(D) $6\cos 3x$ (E) $2\sin 3x\cos 3x$

(ANSWERS ONLY)
(SHOW WORK)

Let f be the function defined by $f(x)=\frac{2x-5}{x^2-4}$.

(a) Find the domain of f. $x\neq\pm 2$

(b) Write an equation for each vertical and each horizontal asymptote for the graph of f. VA $x=+2$ $x=-2$ HA $y=0$

(c) Find $f'(x)$. $= \frac{-2x^2+10x-8}{(x^2-4)^2} = \frac{-2(x-4)(x+1)}{(x^2-4)^2}$

(d) Write an equation for the line tangent to the graph of f at the point $(0, f(0))$.

$y=-\frac{1}{2}x+\frac{5}{4}$

$\frac{2(x^2-4)-(2x-5)(2)}{(x^2-4)^2}$

Homework Mon 4/30/18

AB Review #4 – Noncalculator KEY

10. The *derivative* of $f(x)=\frac{x^4}{3}-\frac{x^5}{5}$ attains its maximum value at $x=$

(A) -1 (B) 0 (C) 1 (D) $\frac{4}{3}$ (E) $\frac{5}{3}$

---

11. If the line $3x-4y=0$ is tangent in the first quadrant to the curve $y=x^3+k$, then k is

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) 0 (D) $-\frac{1}{8}$ (E) $-\frac{1}{2}$

---

12. If $f(x)=2x^3+Ax^2+Bx-5$ and if $f(2)=3$ and $f(-2)=-37$, what is the value of $A+B$?

(A) -6 (B) -3 (C) -1 (D) 2

(E) It cannot be determined from the information given.

---

13. The acceleration α of a body moving in a straight line is given in terms of time t by $\alpha=8-6t$. If the velocity of the body is 25 at $t=1$ and if $s(t)$ is the distance of the body from the origin at time t, what is $s(4)-s(2)$?

(A) 20 (B) 24 (C) 28 (D) 32 (E) 42

---

14. If $f(x)=x^{\frac{1}{3}}(x-2)^{\frac{2}{3}}$ for all x, then the domain of f' is

(A) $\{x|x\neq 0\}$ (B) $\{x|x>0\}$ (C) $\{x|0\le x\le 2\}$

(D) $\{x|x\neq 0 \text{ and } x\neq 2\}$ (E) $\{x|x \text{ is a real number}\}$

---

15. The area of the region bounded by the lines $x=0$, $x=2$, and $y=0$ and the curve $y=e^{\frac{x}{2}}$ is

(A) $\frac{e-1}{2}$ (B) $e-1$ (C) $2(e-1)$ (D) $2e-1$ (E) $2e$

---

16. The number of bacteria in a culture is growing at a rate of $3000e^{\frac{2t}{5}}$ per unit of time t. At $t=0$, the number of bacteria present was 7,500. Find the number present at $t=5$.

(A) $1{,}200e^2$ (B) $3{,}000e^2$ (C) $7{,}500e^2$ (D) $7{,}500e^5$ (E) $\frac{15{,}000}{7}e^7$

---

17. What is the area of the region completely bounded by the curve $y=-x^2+x+6$ and the line $y=4$?

(A) $\frac{3}{2}$ (B) $\frac{7}{3}$ (C) $\frac{9}{2}$ (D) $\frac{31}{6}$ (E) $\frac{33}{2}$

18. $\frac{d}{dx}(\arcsin 2x) =$

(A) $\frac{-1}{2\sqrt{1-4x^2}}$ (B) $\frac{-2}{\sqrt{4x^2-1}}$ (C) $\frac{1}{2\sqrt{1-4x^2}}$

(D) $\frac{2}{\sqrt{1-4x^2}}$ (E) $\frac{2}{\sqrt{4x^2-1}}$

20. If F and f are continuous functions such that $F'(x)=f(x)$ for all x, then $\int_a^b f(x)\,dx$ is

(A) $F'(a)-F'(b)$
(B) $F'(b)-F'(a)$
(C) $F(a)-F(b)$
(D) $F(b)-F(a)$
(E) none of the above

(Answers only)
(Show work)

Let R be the region enclosed by the graphs of $y=e^{-x}$, $y=e^{x}$, and $x=\ln 4$.

(a) Find the area of R by setting up and evaluating a definite integral. $A=\frac{7}{4}$

(b) Set up, but do not integrate, an integral expression in terms of a single variable for the volume generated when the region R is revolved about the x-axis. $V=\pi\int_0^{\ln 4}\left(e^{2x}-e^{-2x}\right)dx$

(c) Set up, but do not integrate, an integral expression in terms of a single variable for the volume generated when the region R is revolved about the y-axis. $V=\int_{\frac{1}{4}}^{4}(\ln 4)^2-(\ln y)^2\,dy$

HOMEWORK TUE 5/1/18

AB Review #5 - Mon - Calculator KEY

21. $\int_0^1 (x+1)e^{x^2+2x}\,dx =$

(A) $\frac{e^3}{2}$ (B) $\frac{e^3-1}{2}$ (C) $\frac{e^4-e}{2}$ (D) e^3-1 (E) e^4-e

---

22. Given the function defined by $f(x)=3x^5-20x^3$, find all values of x for which the graph of f is concave up.

(A) $x>0$
(B) $-\sqrt{2}<x<0$ or $x>\sqrt{2}$
(C) $-2<x<0$ or $x>2$
(D) $x>\sqrt{2}$
(E) $-2<x<2$

---

25. $\int_0^{\pi/4} \tan^2 x\,dx =$

(A) $\frac{\pi}{4}-1$ (B) $1-\frac{\pi}{4}$ (C) $\frac{1}{3}$ (D) $\sqrt{2}-1$ (E) $\frac{\pi}{4}+1$

---

26. The radius r of a sphere is increasing at the uniform rate of 0.3 inches per second. At the instant when the surface area S becomes 100π square inches, what is the rate of increase, in cubic inches per second, in the volume V? $\left(S=4\pi r^2 \text{ and } V=\frac{4}{3}\pi r^3\right)$

(A) 10π (B) 12π (C) 22.5π (D) 25π (E) 30π

---

27. $\int_0^{1/2} \frac{2x}{\sqrt{1-x^2}}\,dx =$

(A) $1-\frac{\sqrt{3}}{2}$ (B) $\frac{1}{2}\ln\frac{3}{4}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{6}-1$ (E) $2-\sqrt{3}$

---

28. A point moves in a straight line so that its distance at time t from a fixed point of the line is $8t-3t^2$. What is the *total* distance covered by the point between $t=1$ and $t=2$?

(A) 1 (B) $\frac{4}{3}$ (C) $\frac{5}{3}$ (D) 2 (E) 5

---

30. $\int_1^2 \frac{x-4}{x^2}\,dx =$

(A) $-\frac{1}{2}$ (B) $\ln 2-2$ (C) $\ln 2$ (D) 2 (E) $\ln 2+2$

32. $\int \frac{5}{1+x^2}\,dx =$

(A) $\frac{-10x}{\left(1+x^2\right)^2}+C$ (B) $\frac{5}{2x}\ln\left(1+x^2\right)+C$ (C) $5x-\frac{5}{x}+C$

(D) $5\arctan x+C$ (E) $5\ln\left(1+x^2\right)+C$

---

34. The average value of $\sqrt{x}$ over the interval $0\le x\le 2$ is

(A) $\frac{1}{3}\sqrt{2}$ (B) $\frac{1}{2}\sqrt{2}$ (C) $\frac{2}{3}\sqrt{2}$ (D) 1 (E) $\frac{4}{3}\sqrt{2}$

---

35. The region in the first quadrant bounded by the graph of $y=\sec x$, $x=\frac{\pi}{4}$, and the axes is rotated about the x-axis. What is the volume of the solid generated?

(A) $\frac{\pi^2}{4}$ (B) $\pi-1$ (C) π (D) 2π (E) $\frac{8\pi}{3}$

(ANSWERS ONLY)
(Show work)

Let f be the function defined for $\frac{\pi}{6}\le x\le\frac{5\pi}{6}$ by $f(x)=x+\sin^2 x$.

(a) Find all values of x for which $f'(x)=1$. $x\in\left\{0,\frac{\pi}{2}\right\}+\pi k$

(b) Find the x-coordinates of all minimum points of f. Justify your answer. NONE b/c $1+\sin 2x>0$ for all x

(c) Find the x-coordinates of all inflection points of f. Justify your answer.

$x\in\left\{\frac{\pi}{4},\frac{3\pi}{4}\right\}+\pi k$

b/c $f''(x)$ changes signs at these values.

HOMEWORK WED 5/2/18

AB Review #6 - Non-Calculator KEY

36. If $y = e^{nx}$, then $\frac{d^n y}{dx^n} =$

(A) $n^n e^{nx}$ (B) $n!e^{nx}$ (C) ne^{nx} (D) $n^n e^x$ (E) $n!e^x$

---

37. If $\frac{dy}{dx} = 4y$ and if $y = 4$ when $x = 0$, then $y =$

(A) $4e^{4x}$ (B) e^{4x} (C) $3+e^{4x}$ (D) $4+e^{4x}$ (E) $2x^2+4$

---

40. If $\tan(xy) = x$, then $\frac{dy}{dx} =$

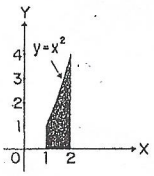
(A) $\frac{1-y\tan(xy)\sec(xy)}{x\tan(xy)\sec(xy)}$ (B) $\frac{\sec^2(xy)-y}{x}$ (C) $\cos^2(xy)$

(D) $\frac{\cos^2(xy)}{x}$ (E) $\frac{\cos^2(xy)-y}{x}$

---

41. Given $f(x) = \begin{cases} x+1 & \text{for } x < 0, \\ \cos \pi x & \text{for } x \geq 0, \end{cases}$ $\int_{-1}^{1} f(x)\,dx =$

(A) $\frac{1}{2}+\frac{1}{\pi}$ (B) $-\frac{1}{2}$ (C) $\frac{1}{2}-\frac{1}{\pi}$ (D) $\frac{1}{2}$ (E) $-\frac{1}{2}+\pi$



42. Calculate the approximate area of the shaded region in the figure by the trapezoidal rule, using divisions at $x = \frac{4}{3}$ and $x = \frac{5}{3}$.

(A) $\frac{50}{27}$ (B) $\frac{251}{108}$ (C) $\frac{7}{3}$ (D) $\frac{127}{54}$ (E) $\frac{77}{27}$

---

1. If $f(x) = e^{1/x}$, then $f'(x) =$

(A) $-\frac{e^{1/x}}{x^2}$ (B) $-e^{1/x}$ (C) $\frac{e^{1/x}}{x}$ (D) $\frac{e^{1/x}}{x^2}$ (E) $\frac{1}{x}e^{(1/x)-1}$

3. If $f(x)=x+\frac{1}{x}$, then the set of values for which f increases is

(A) $(-\infty,-1]\cup[1,\infty)$ (B) $[-1,1]$ (C) $(-\infty,\infty)$

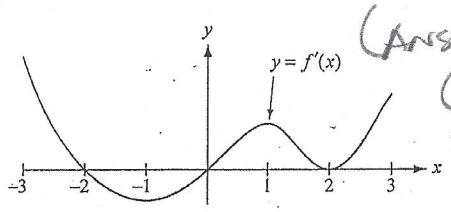
(D) $(0,\infty)$ (E) $(-\infty,0)\cup(0,\infty)$

---

4. For what non-negative value of b is the line given by $y=-\frac{1}{3}x+b$ normal to the curve $y=x^3$?

(A) 0 (B) 1 (C) $\frac{4}{3}$ (D) $\frac{10}{3}$ (E) $\frac{10\sqrt{3}}{3}$

(ANSWERS ONLY)
(SHOW WORK)



Note: This is the graph of the derivative of f, not the graph of f.

The figure above shows the graph of f', the derivative of a function f. The domain of the function f is the set of all x such that $-3\le x\le 3$.

(a) For what values of x, $-3<x<3$, does f have a relative maximum? A relative minimum? Justify your answer. MAX @ $x=-2$ b/c f' changes signs (+) to (−)
MIN @ $x=0$ b/c f' changes signs (−) to (+).

(b) For what values of x is the graph of f concave up? Justify your answer. CCUP on $x\in(-1,1)(2,3)$ b/c f' is increasing

(c) Use the information found in parts (a) and (b) and the fact that $f(-3)=0$ to sketch a possible graph of f on the axes provided below.