# MC HW Answers

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MC MC

## 1993 Calculus AB Solutions

1. C $f'(x) = \frac{3}{2}x^{\frac{1}{2}}$; $f'(4) = \frac{3}{2} \cdot 4^{\frac{1}{2}} = \frac{3}{2} \cdot 2 = 3$

2. B Summing pieces of the form: (vertical)·(small width), vertical $= (d - f(x))$, width $= \Delta x$
   Area $= \int_a^b (d - f(x))\,dx$

3. D Divide each term by $n^3$. $\lim_{n \to \infty} \frac{3n^3 - 5n}{n^3 - 2n^2 + 1} = \lim_{n \to \infty} \frac{3 - \frac{5}{n^2}}{1 - \frac{2}{n} + \frac{1}{n^3}} = 3$

4. A $3x^2 + 3(y + x \cdot y') + 6y^2 \cdot y' = 0$; $y'(3x + 6y^2) = -(3x^2 + 3y)$
   $y' = -\frac{3x^2 + 3y}{3x + 6y^2} = -\frac{x^2 + y}{x + 2y^2}$

5. A $\lim_{x \to -2} \frac{x^2 - 4}{x + 2} = \lim_{x \to -2} \frac{(x+2)(x-2)}{x+2} = \lim_{x \to -2} (x - 2) = -4$. For continuity $f(-2)$ must be $-4$.

6. D Area $= \int_3^4 \frac{1}{x-1}\,dx = \left(\ln|x-1|\right)\Big|_3^4 = \ln 3 - \ln 2 = \ln\frac{3}{2}$

7. B $y' = \frac{2 \cdot (3x - 2) - (2x + 3) \cdot 3}{(3x - 2)^2}$; $y'(1) = -13$. Tangent line: $y - 5 = -13(x - 1) \Rightarrow 13x + y = 18$

8. E $y' = \sec^2 x + \csc^2 x$

9. E $h(x) = f(|x|) = 3|x|^2 - 1 = 3x^2 - 1$

10. D $f'(x) = 2(x-1) \cdot \sin x + (x-1)^2 \cos x$; $f'(0) = (-2) \cdot 0 + 1 \cdot 1 = 1$

11. C $a(t) = 6t - 2$; $v(t) = 3t^2 - 2t + C$ and $v(3) = 25 \Rightarrow 25 = 27 - 6 + C$; $v(t) = 3t^2 - 2t + 4$
    $x(t) = t^3 - t^2 + 4t + K$; Since $x(1) = 10$, $K = 6$; $x(t) = t^3 - t^2 + 4t + 6$.

12. B The only one that is true is II. The others can easily been seen as false by examples. For example, let $f(x)=1$ and $g(x)=1$ with $a = 0$ and $b = 2$. Then I gives $2 = 4$ and III gives $2=\sqrt{2}$, both false statements.

13. A period $=\dfrac{2\pi}{B}=\dfrac{2\pi}{3}$

14. A Let $u=x^3+1$. Then $\displaystyle\int \frac{3x^2}{\sqrt{x^3+1}}\,dx=\int u^{-1/2}du=2u^{1/2}+C=2\sqrt{x^3+1}+C$

15. D $f'(x)=(x-3)^2+2(x-2)(x-3)=(x-3)(3x-7)$; $f'(x)$ changes from positive to negative at $x=\dfrac{7}{3}$.

16. B $y'=2\dfrac{\sec x\tan x}{\sec x}=2\tan x$; $y'(\pi/4)=2\tan(\pi/4)=2$. The slope of the normal line $-\dfrac{1}{y'(\pi/4)}=-\dfrac{1}{2}$

17. E Expand the integrand. $\displaystyle\int (x^2+1)^2\,dx=\int (x^4+2x^2+1)\,dx=\frac{1}{5}x^5+\frac{2}{3}x^3+x+C$

18. D Want $c$ so that $f'(c)=\dfrac{f\left(\frac{3\pi}{2}\right)-f\left(\frac{\pi}{2}\right)}{\frac{3\pi}{2}-\frac{\pi}{2}}=\dfrac{\sin\left(\frac{3\pi}{4}\right)-\sin\left(\frac{\pi}{4}\right)}{\pi}=\dfrac{0}{\pi}$.

$f'(c)=\dfrac{1}{2}\cos\left(\dfrac{c}{2}\right)=0\Rightarrow c=\pi$

19. E The only one that is true is E. A consideration of the graph of $y=f(x)$, which is a standard cubic to the left of 0 and a line with slope 1 to the right of 0, shows the other options to be false.