Solutions - Ex 2 - Test 01
MA161

MA 161 EXAM 2 **SPRING 2010**

1. Let $f(x) = \begin{cases} 1, & \text{for } x \le 0 \\ \frac{\sin x}{x}, & \text{for } 0 < x \le \pi \\ x, & \text{for } x > \pi. \end{cases}$

   Which of the following describes the numbers at which f is continuous?

   A. f is continuous at all numbers except 0 and π.

   B. f is continuous at all numbers except 0.

   C. f is continuous at all numbers except π.

   D. f is continuous at all numbers in $(-\infty, 0) \cup (\pi, \infty)$.

   E. f is continuous at all numbers.

$$\frac{\sqrt{16x^2+x} + 4x}{\sqrt{16x^2+x} + 4x}$$

2. Evaluate $\lim_{x\to\infty} (\sqrt{16x^2+x} - 4x)$.

   A. ∞

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

   C. $\frac{1}{6}$

   D. 0

   E. The limit does not exist.

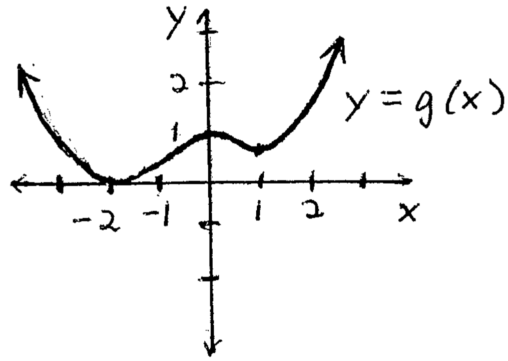
$$4x\left[\sqrt{1+\frac{x}{16x^2}} - 1\right] \qquad \frac{x}{4x+4x}$$

$$\approx 4x\left(1 + \frac{1}{2}\cdot\frac{1}{16x} - 1\right)$$

$$4x \cdot \frac{1}{32x} = \frac{1}{8}$$

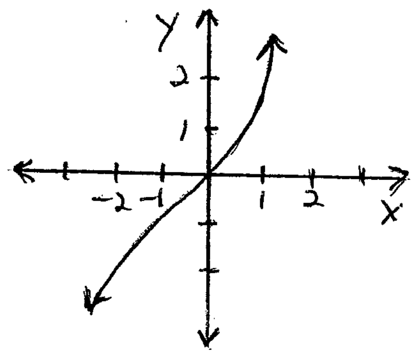
$$= \frac{16x^2 + x - 16x^2}{\sqrt{16x^2+x} + 4x} \qquad \frac{32x^2}{4x}$$

3. If the graph of $g(x)$ is given by

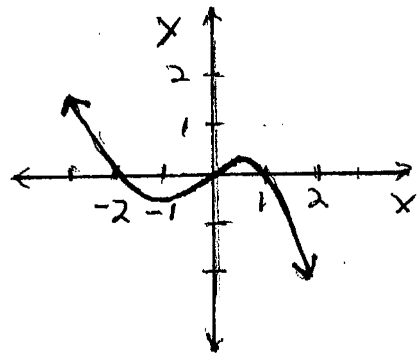


which of the following is most like the graph of $g'(x)$?

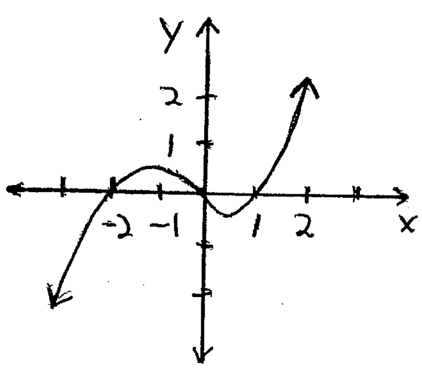
A.



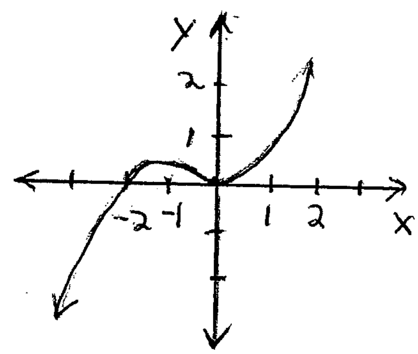
B.



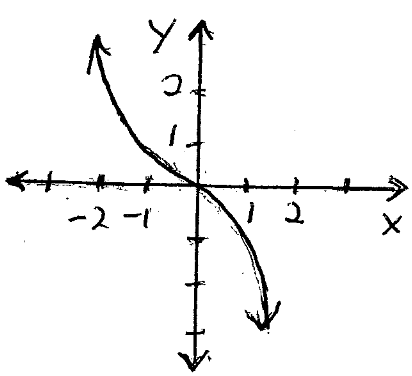
C.



D.



E.



4. If $f(x) = x^3 + \dfrac{4}{\sqrt{x}}$, what is $f'(2)$?

A. $3 - 8\sqrt{2}$

B. $3 - 4\sqrt{2}$

C. $12 - 1\sqrt{2}$

D. $12 - \dfrac{1}{\sqrt{2}}$

E. $12 - \dfrac{2}{\sqrt{2}}$

$3x^2 - \frac{1}{2} \cdot \frac{4}{x^{3/2}}$

$12 - \frac{2}{2^{3/2}} = 12 - \frac{1}{\sqrt{2}}$

5. At what values of x does the graph of $y = 2x^3 + 3x^2 - 120x + 1$ have a horizontal tangent?

A. -5 and 4

B. 5 and -4

C. $-1 \pm \dfrac{\sqrt{164}}{2}$

D. 6 and -1

E. -1 and 6

~~12~~

$6x^2 + 6x - 120 = 0$

$x^2 + x - 20 = 0$

$(x+5)(x-4) = 0$

$x = -5, 4$

8. Compute $\dfrac{d}{d\theta}\left(\dfrac{1}{\sec\theta+\tan\theta}\right)$.

A. $\dfrac{-\sec\theta}{\sec\theta+\tan\theta}$

B. $-\dfrac{1}{(\sec\theta+\tan\theta)^2}$

C. $\dfrac{\sec\theta}{(\sec\theta+\tan\theta)^2}$

D. $\dfrac{\tan\theta}{\sec\theta+\tan\theta}$

E. $\dfrac{-\tan\theta}{\sec\theta+\tan\theta}$

$$-\frac{1}{(s+t)^2}\,(st+s^2)$$

$$= -\frac{s}{s+t}$$

9. If $f(x) = (\sqrt{2x^2+1}-2)^3$, compute $f'(2)$.

A. 2

B. 6

C. 3

D. 4

E. 12

$$3\left[\sqrt{2x^2+1}-2\right]^2\left(\frac{1}{2}\,\frac{1}{\sqrt{2x^2+1}}\right)\cdot 4x$$

$$3\cdot 1^2\cdot\left(\frac{4}{3}\right) = 4$$

$$3\cdot 1^2\cdot\left[\frac{1}{2}\cdot\frac{1}{\sqrt{2x^2+1}}\right]\cdot 4x$$

$$\frac{1}{2}\cdot 8 = 4$$

10. If the curve C is defined by $x^2y^3 + x - y^2 = 5$, find the slope of the line tangent to C at $(2, 1)$.

A. $-\frac{3}{2}$

B. -2

C. $-\frac{1}{2}$

D. $-\frac{5}{14}$

E. $-\frac{5}{12}$

$2xy^3 + x^2 \cdot 3y^2 y' + 1 - 2yy' = 0$

$y'(3x^2y^2 - 2y) = -1 - 2xy^3$

$y'(12 - 2) = -1 - 4$

$y' = -\frac{1}{2}$

11. Compute $\frac{d}{dx}\left(\frac{1}{\ln x}\right)$.

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

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

C. $\frac{1}{x^2(\ln x)^2}$

D. $\frac{1}{x \ln x}$

E. $-\frac{1}{x(\ln x)^2}$

$-\frac{\frac{1}{x}}{(\ln x)^2} = -\frac{1}{x(\ln x)^2}$

12. If $x(t) = (2t^2+2)^{3/2}$ denotes the position of a particle in meters and t is measured in seconds, compute the acceleration when $t = 1$.

A. 6 m/sec.^{2}

B. 12 m/sec.^{2}

C. 24 m/sec.^{2}

D. 8 m/sec.^{2}

E. 18 m/sec.^{2}

$$x' = \frac{3}{2} \cdot (2t^3+2)^{\frac{1}{2}} \cdot 4t$$

$$= \underline{6t}\,(2t^2+2)^{\frac{1}{2}}$$

$$\to 6 \cdot (2t^2+2)^{\frac{1}{2}} + 6t \cdot \frac{1}{2} \cdot \frac{4t}{(2t^2+2)^{1/2}}$$

$$= 6 \cdot 2 + 12 \cdot \frac{1}{2} =$$

$$= 18$$