Multiple Choice Questions

Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam and in the corresponding questions that follow.

Exam 1
Spring
2012

1. The owner of a coffee shop decides to sell a blend of her two most popular types of coffee. The premium roast costs \$10.50 per pound and the classic roast costs \$6.50 per pound. How many pounds of the premium roast should she include in the blend if she wants 20 pounds of the blend and she wants to sell the blend for \$8.50 per pound?

$p + c = 20 \Rightarrow c = 20 - p$

$6.50 \cdot c + 10.50p = 8.50 \cdot 20$

$6.50(20-p) + 10.50p = 170$

$130 - 6.50p + 10.50p = 170$

$4p = 40 \Rightarrow p = 10$ pounds

Possibilities:

(a) 7 pounds of the premium roast
(b) 8 pounds of the premium roast
(c) 9 pounds of the premium roast
(d) 10 pounds of the premium roast
(e) None of the above

2. Determine the equation of the line that passes through the points $(2, -3)$ and $(4, -4)$. Write the line in $y = mx + b$ form.

$m = \frac{(-3)-(-4)}{2-4} = -\frac{1}{2}$

$y - (-3) = (-\frac{1}{2})(x - 2)$

$y + 3 = (-\frac{1}{2})x + 1$

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

Possibilities:

(a) $y = -(1/2)x - 2$
(b) $y = -(1/2)x + 2$
(c) $y = (1/2)x + 2$
(d) $y = (1/2)x - 2$
(e) $y = -(1/2)x + 4$

3. Determine $f(1)$, given

$$f(x) = \begin{cases} -x, & \text{for } x \le 2 \\ 4x + 5, & \text{for } x > 2 \end{cases}$$

$f(1) = -1$

Possibilities:

(a) 0
(b) 2
(c) 1
(d) 9
(e) -1

4. Solve the equation $x^3 + 4xy + 5y = 8$ for y in terms of x

Possibilities:

(a) $y = \dfrac{8 - x^3}{4x + 5}$

(b) $y = 8 - x^3 - 4x - 5$

(c) $y = \dfrac{4x + 5}{x^3 - 8}$

(d) $y = \dfrac{4x + 5}{8 - x^3}$

(e) $y = \dfrac{x^3 - 8}{4x + 5}$

$4xy + 5y = 8 - x^3$

$(4x+5)y = 8 - x^3$

$y = \dfrac{8 - x^3}{4x+5}$

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5. The line $y = x$ intersects the curve $y = 5x - 16$ at the point $(x, y) = (4, A)$. Determine A. (i.e., find the y-coordinate of the point of intersection)

Possibilities:

(a) 3

(b) 7/2

(c) 4

(d) 9/2

(e) 5

$\begin{cases} y = 5x - 16 \\ y = x \end{cases} \Rightarrow x = 5x - 16$

$\Rightarrow 4x = 16$

$\Rightarrow x = 4$

So $y = x = 4$

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6. A train leaves city A at 8:00 am and arrives in city B at 11:30 am. The train leaves city B at 11:30 am and arrives in city C at 1:30 pm. The average velocity from city A to city B was 42 miles per hour and the average velocity from city B to city C was 64 miles per hour. Determine the average velocity from city A to city C.

Possibilities:

(a) 57.00 miles per hour

(b) 114.00 miles per hour

(c) 50.00 miles per hour

(d) 137.50 miles per hour

(e) 59.33 miles per hour

$A \to B$ 3.5 hrs, 42 mph

$B \to C$ 2 hrs, 64 mph

Distance A to B = 42 mph · 3.5 hrs = 147 miles

Distance B to C = 64 mph · 2 hrs = 128 miles

Total Dist = 275 miles

$\dfrac{275 \text{ miles}}{5.5 \text{ hr}} = 50$ mph

7. Determine the average rate of change of $g(x)$ from $x = -1$ to $x = 2$, where

$$g(x) = x^2 + 5x + 14$$

$$\frac{g(2) - g(-1)}{2-(-1)} = \frac{(2^2 + 5 \cdot 2 + 14) - ((-1)^2 + 5(-1) + 14)}{3}$$

Possibilities:

(a) ~~18.00~~
(b) 6.00
(c) 8.00
(d) 10.00
(e) 14.00

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8. Determine the value of A so that the average rate of change of $f(t)$ from $t = 0$ to $t = A$ is equal to 9, where

$$f(t) = t^3$$

$$AROC = \frac{A^3 - 0^3}{A - 0} = \frac{A^3}{A} = A^2$$

$$9 = A^2 \Rightarrow A = 3$$

Possibilities:

(a) $A = 3$
(b) ~~$A = 18$~~
(c) $A = 9$
(d) $A = 27$
(e) $A = 6$

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9. A particle moves in a straight line. The position of the particle, in meters, after t seconds is given by

$$s(t) = t^2 + 2t$$

Determine the average velocity of the particle from time $t = 1$ to $t = 1 + h$.

$$\frac{s(1+h) - s(1)}{1+h-1} = \frac{(1+h)^2 + 2(1+h) - (1^2 + 2 \cdot 1)}{h}$$

$$= \frac{\cancel{1} + 2h + h^2 + \cancel{2} + 2h - \cancel{3}}{h}$$

$$= \frac{4h + h^2}{h} = \frac{(4+h)h}{h} =$$

Possibilities:

(a) Average velocity = $4 + h$ meters per second
(b) ~~Average velocity = $2 + h$ meters per second~~
(c) Average velocity = $2h + 2h + h^2$ meters per second
(d) Average velocity = $(2h + 4 + 2h + h^2)/h$ meters per second
(e) Average velocity = $2h + h^2$ meters per second

10. Find the value of x for which the tangent line to $y = 5x^2 + 3x + 2$ is parallel to the line $y = 9x + 2$

Possibilities:

(a) $-1/5$
(b) 0
(c) $1/5$
(d) $2/5$
(e) $3/5$

Slope T. L is
$y' = 5 \cdot 2x + 3 = 10x + 3$
Parallel to line w/ slope 9
Need $10x + 3 = 9$
$10x = 6 \Rightarrow x = \frac{3}{5}$

11. Suppose $f(x) = ax^2 + bx + c$ for unknown values a, b, and c, and suppose $f'(x) = 10x + 4$. Determine the values of a and b.

Possibilities:

(a) $a = 5$ and $b = 4$
(b) $a = 10$ and $b = 4$
(c) $a = 4$ and $b = 5$
(d) $a = 4$ and $b = 10$
(e) There is not enough information to find a and b.

$f'(x) = 2ax + b$
$= 10x + 4$
$2a = 10 \Rightarrow a = 5$
$b = 4$

12. Determine the limit

$$\lim_{x \to 2} \frac{x^2 + 3x + 2}{x^2 - 4x + 3} = \frac{2^2 + 3 \cdot 2 + 2}{2^2 - 4 \cdot 2 + 3}$$

$$= \frac{12}{-1} = -12$$

Possibilities:

(a) 12
(b) -12
(c) 0
(d) $1/12$
(e) The limit is infinite or the limit does not exist.

13. Determine the limit

$$\lim_{x\to 1}\frac{x^2-3x+2}{x^2+x-2} = \lim_{x \to 1} \frac{\cancel{(x-1)}(x-2)}{\cancel{(x-1)}(x+2)}$$

$$= \lim_{x\to 1} \frac{x-2}{x+2} = \frac{1-2}{1+2} = \frac{-1}{3}$$

Possibilities:

(a) $-1/3$
(b) 0
(c) $1/3$
(d) $2/3$
(e) The limit is infinite or the limit does not exist

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14. Determine the one-sided limit

$$\lim_{x\to -4^-}\frac{|2x+8|}{x+4}$$

Plug in x values below -4, but near -4

$$x = -4.001: \frac{|2(-4.001)+8|}{-4.001+4} = \frac{|8-8.002|}{-.001} = -2$$

Possibilities:

(a) 4
(b) -4
(c) 2
(d) -2
(e) The limit is infinite or the limit does not exist

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15. Which of the following three statements are true?

(I) If the graph of $y = f(x)$ has a vertical asymptote at $x = a$ then $\lim_{x\to a} f(x)$ does not exist. TRUE
(II) If the graph of $y = f(x)$ has a corner at $x = a$ then $\lim_{x\to a} f(x)$ does not exist. FALSE
(III) If the graph of $y = f(x)$ has a jump at $x = a$ then $\lim_{x\to a} f(x)$ does not exist. TRUE

Possibilities:

(a) Only (III) is true
(b) (I) and (III) are true
(c) Only (I) is true
(d) Only (II) is true
(e) (II) and (III) are true

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16. Find the value of A which makes $f(x)$ continuous everywhere, where

$$f(x) = \begin{cases} x^2 + A, & \text{if } \ x \le 5; \\ 5/x, & \text{if } \ x > 5 \end{cases}$$

$$\lim_{x \to 5^-} f(x) = \lim_{x \to 5^+} f(x)$$

$$\lim_{x \to 5^-} x^2 + A = \lim_{x \to 5^+} \frac{5}{x}$$

$$5^2 + A = \frac{5}{5}$$

$$25 + A = 1 \Rightarrow A = -24$$

Possibilities:

(a) $A = 1/5$
(b) $A = -24$
(c) $A = -25$
(d) $A = -1/5$
(e) No such value of A exists

17. Determine the equation of the tangent line to $f(x) = 4x^2 - 2x + 13$ at $x = 2$.

Slope $= f'(x) = 8x - 2$

$f'(2) = 8 \cdot 2 - 2 = 14$

Point: $f(2) = 4 \cdot 2^2 - 2 \cdot 2 + 13 = 25$

$y - 25 = 14(x - 2)$

Possibilities:

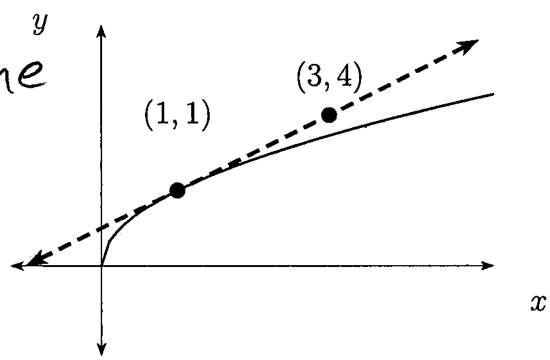
(a) $y = 25(x + 2) - 14$
(b) $y = 14(x + 2) + 25$
(c) $y = 14(x + 2) - 25$
(d) $y = 25(x - 2) - 14$
(e) $y = 14(x - 2) + 25$

18. The graph of $y = g(x)$ is shown (solid), as well as the tangent line to the graph (dotted) at $x = 1$. Determine $g'(1)$.

$g'(1) = $ Slope T. Line

$= \frac{4-1}{3-1}$

$= \frac{3}{2}.$



Possibilities:

(a) 3/2
(b) 1
(c) 5/2
(d) 2
(e) 1/2

19. A particle is traveling along a straight line. The position of the particle at time t is given by $s(t) = -16t^2 + 70t + 125$. Determine the velocity of the particle at time $t = 2$.

Possibilities:

$s'(t) = \text{Velocity}$

$= -32t + 70$

$s'(2) = -32 \cdot 2 + 70 = 70 - 64$

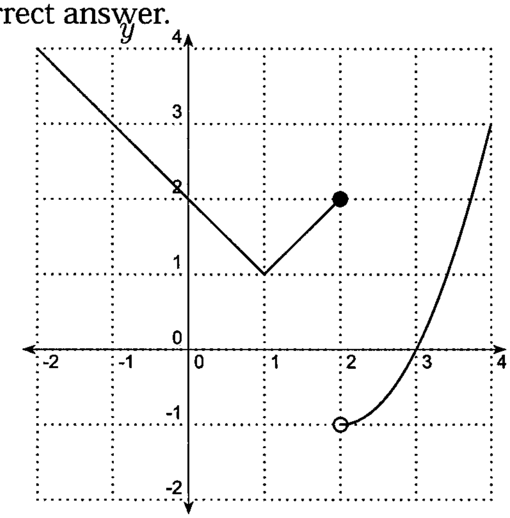
$= 6$

(a) 6
(b) 11
(c) 16
(d) 21
(e) 26

20. The graph of $y = f(x)$ is shown. Select the correct answer.

Discontinuous at $x = 2$ only

Not diff. at $x = 2$ (Jump) & $x = 1$ (Corner)



Possibilities:

(a) $f(x)$ is neither continuous nor differentiable at $x = 1$; $f(x)$ is continuous but not differentiiable at $x = 2$ — False. False

(b) $f(x)$ is continuous but not differentiable at $x = 1$; $f(x)$ is neither continuous nor differentiiable at $x = 2$ — True True

(c) $f(x)$ is continuous and differentiable at $x = 1$; $f(x)$ is differentiable but not continuous at $x = 2$ — False

(d) $f(x)$ is neither continuous nor differentiable at $x = 1$; $f(x)$ is neither continuous nor differentiiable at $x = 2$ — False True

(e) $f(x)$ is differentiable but not continuous at $x = 1$; $f(x)$ is neither continuous nor differentiiable at $x = 2$ — False True.