

AB Calculus '19-20  
Dx Apps II Practice Test  
No Calculator

Name \_\_\_\_\_

1. A particle moves along a straight line with velocity given by  $v(t) = 5 + 4t - t^2$ . When is the particle *slowing down*?

- a)  $t \in (-\infty, 1)$
- b)  $t \in (-\infty, -1) \cup (5, \infty)$
- c)  $t \in (-1, 2) \cup (5, \infty)$
- d)  $t \in (-\infty, -1) \cup (2, 5)$
- e)  $t \in (5, \infty)$

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2. A particle is moving along the  $x$ -axis in such a way that its velocity at time  $t > 0$  is given by  $v(t) = \frac{\ln t}{t}$ . At what value of  $t$  does  $v$  attain its maximum?

- (a) 1      (b)  $e^{1/2}$       (c)  $e$       (d)  $e^{3/2}$
  - (e) There is no maximum value of  $v$ .
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3. Consider the closed curve in the  $x$ - $y$  plane given by  $2x^2 + 5x + y^2 + y = 8$ . Which of the following is correct?

(a)  $\frac{dy}{dx} = -\frac{4x+5}{8x+2y+1}$       (b)  $\frac{dy}{dx} = \frac{4x+5}{2y+1}$

(c)  $\frac{dy}{dx} = -\frac{4x+5}{8x+2y}$       (d)  $\frac{dy}{dx} = \frac{4x+5}{8x+2y}$

(d)  $\frac{dy}{dx} = \frac{-4x-5}{1+2y}$

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4. Let  $H$  represent a circle with diameter  $k$ . The area of  $H$  decreases at a rate of  $2\pi$  cm/sec. When the radius is 3cm, what is  $\frac{dk}{dt}$  in cm/sec?

a)  $-\frac{2}{3}$       b)  $-\frac{1}{3}$       c)  $\frac{1}{3}$       d)  $\frac{2}{3}$       e) 2

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5. A particle's acceleration function is  $a(t) = \sin 2t$ , and its velocity is 0 and position is 1 at  $t = 0$ . Which of these represents the particle's position function?

a)  $x(t) = -\sin 2t + 1$

b)  $x(t) = -\sin 2t - t + 1$

c)  $x(t) = -\frac{1}{2}\cos 2t + \frac{1}{2}$

d)  $x(t) = \frac{1}{2}\cos 2t - \frac{1}{2}$

e)  $x(t) = -\frac{1}{4}\sin 2t + \frac{1}{2}t + 1$

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6. A particle is moving upward along the y-axis until it reaches the origin and then it moves downward such that  $v(t) = 8 - 2t$  for  $t \geq 0$ . The position of the particle at time  $t$  is given by

- a)  $y(t) = -t^2 + 8t - 16$       b)  $y(t) = -t^2 + 8t + 16$   
c)  $y(t) = 2t^2 - 8t - 16$       d)  $y(t) = 8t - t^2$   
e)  $y(t) = 8t - 2t^2$
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7. Gravel is being dumped from a conveyor belt at a rate of  $35 \text{ ft}^3/\text{min}$  and its coarseness is such that it forms a pile in the shape of a cone whose base diameter and height are always equal. How fast is the height of the pile increasing when the pile is 15ft high?

- a) 0.27 ft/min      b) 1.24 ft/min      c) 0.14 ft/min  
d) 0.2 ft/min      e) 0.6 ft/min
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8. The population  $P(t)$  of a species satisfies the logistic differential equation

$\frac{dP}{dt} = \frac{1}{4000}P(400 - P)$ , where  $P(0) = 100$ . What is the maximum rate of change of  $P(t)$ ?

- a) 10
  - b) 100
  - c) 200
  - d) 400
  - e) 4000
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9. If  $x^2 + xy = 10$ , then when  $x = 2$ ,  $\frac{dy}{dx} =$

- a)  $-\frac{7}{2}$
  - b) -2
  - c)  $\frac{2}{7}$
  - d)  $\frac{3}{2}$
  - e)  $\frac{7}{2}$
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Name \_\_\_\_\_

Score \_\_\_\_\_

Directions: Show all work.

1. Below is a chart of your speed driving to school in meters/second. Use the information below to find the values in a) and b) below.

|                   |   |    |    |     |     |     |     |
|-------------------|---|----|----|-----|-----|-----|-----|
| $t$ (in seconds)  | 0 | 30 | 90 | 120 | 220 | 300 | 360 |
| $v(t)$ (in m/sec) | 0 | 21 | 43 | 38  | 30  | 24  | 0   |

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a. Approximate your acceleration at  $t = 100$ .

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b. Given your result in (a), are you speeding up or slowing down at  $t = 100$ ? Explain, using the correct units.

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c. Find an approximation for  $\int_0^{360} v(t) dt$  using left Riemann rectangles. Express your answer in correct units. Using the correct units, explain the meaning of your result.

2. The fishing industry is a major part of California's economy. A catch-and-release study of Chinook salmon on the Sacramento Delta near Rio Vista was undertaken in 2008. Over 60 days, the rate at which new fish were caught and released followed the equation  $\frac{dF}{dt} = .004F(100 - F)$ , where  $\frac{dF}{dt}$  was measured in number of smolt (young salmon) caught per day.

a) If  $F(0) = 10$ , what is  $\lim_{t \rightarrow \infty} F(t)$ ?

b) Using the correct units, explain  $\lim_{t \rightarrow \infty} F(t)$ .

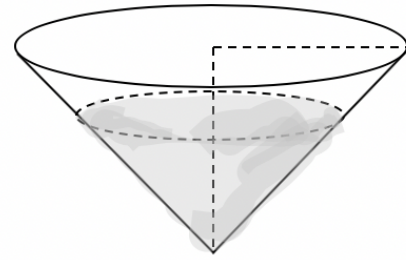
c) If  $F(0) = 25$ , how many smolt are captured and release when  $\frac{dF}{dt}$  is at its greatest?

d) Data from a different study showed  $\frac{dF}{dt} = .004(100 - F)$ , where  $F(0) = 10$ .  
Use separation of variables to solve the differential equation.



3. You are designing a manufacturing process where you are draining water from an inverted conical tank. The radius of the tank 6 meters, and the tank is 9 meters tall. You know that the water drains from the tank at a rate of  $23 \text{ m}^3/\text{hour}$ . [Note:

$$V = \frac{1}{3}\pi r^2 h]$$



a. Find an equation for the volume of the cone depending on the height only.

b. Find  $\frac{dh}{dt}$  when  $h = 6$ .

c. How fast is the surface area of the water changing?

